agriculture

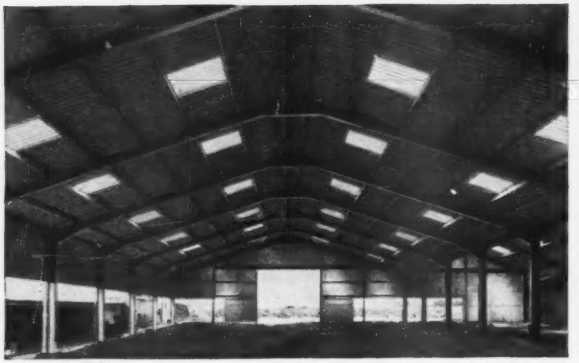
Vol. 75 No. 12 December 1968

Published for the Ministry of Agriculture, Fisheries and Food by Her Majesty's Stationery Office

1s. 3d.
MONTHLY

Handling and Winter Feeding of Cattle page 580

OVER 100 YEARS EXPERIENCE AT YOUR SERVICE



The manufacture and construction of farm buildings has been the specialised business of John Elwell Ltd., for over a century. And they specialise in quality and delivery too. John Elwell Ltd. can meet requirements for Dutch Barns and Agricultural Buildings of all types, and also manufacture galvanised Pig and Cattle Troughs, Fencing Standards, Netting Stakes, Wheelbarrows etc.

JOHN ELWELL Ltd

ROOD END IRONWORKS, OLDBURY, WARLEY, WORCS
Tel: 021-552 1415 (4 lines)
Grams: "Sections, Oldbury"

THE *SPECIALISTS* IN THE MANUFACTURE OF ALL TYPES OF AGRICULTURAL BUILDINGS

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

Experimental Husbandry

Gives accounts of husbandry experiments carried out at both experimental husbandry and commercial farms throughout the country. It should have a wide appeal to farmers, their advisers, research workers and students.

Experimental Horticulture

Designed for commercial growers of fruit, flowers, vegetables and crops under glass, this publication contains accounts of experimental work and its bearing on practical problems in the field.

These publications are issued at irregular intervals (about two or three times a year). Prices range from 6s. to 11s. (postage extra).

Government publications can be purchased from the Government Bookshops in London (post orders to PO Box 569, S.E.1), Edinburgh, Cardiff, Belfast, Manchester, Birmingham and Bristol, or through any bookseller

Agriculture

VOLUME 75 . NUMBER 12 . DECEMBER 1968

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London, S.W.1.

Contents

page

Calf Housing Studies *M. B. Helps* 557
Housing for Dairy Cows *A. J. C. Beaumont* 562
Intensive Rearing of Store Cattle *W. D. Griffiths* and *F. W. Keighley* 566
Surviving the Egg Price Squeeze *J. Halliwell* 570
Progressing to Metric *J. B. Freeland* 574

HANDLING AND WINTER FEEDING OF CATTLE

Equipment for Cattle Handling and Treatment *J. F. Cottam* . . 580
Winter Feeding of Dairy Cows *A. H. Adamson* 583

Wood-pigeons *R. K. Murton, J. D. Norris* and *R. J. P. Thearle* . 587
Research Spot: Rothamsted Experimental Station Report 1967 *Sylvia Laverton* 593
Farming Cameo Series 4: 18. The South Cotswolds *W. D. Peck* . 596
Ministry's Publications 598
From the ALS: Homestead Drainage *P. S. de Mattos* 599
In brief 602
Book Reviews 604
Agricultural Chemicals Approval Scheme 608

© *Crown copyright 1968*

Provided that the source is acknowledged in each instance such articles and notes as are published in this Journal without any specific reservation regarding copyright may be produced in any registered newspaper or public periodical without special permission. The Ministry does not accept responsibility for statements made, or views expressed, in signed contributions to this Journal or in those reproduced from another source.

Further, the Ministry does not accept responsibility for any of the private and trade advertisements included in this publication.

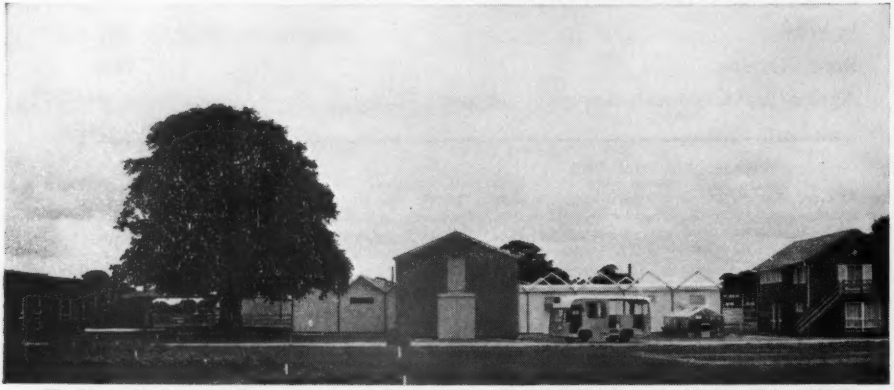
In the interests of factual reporting, occasional reference in this Journal to trade names and proprietary products may be inevitable. No endorsement of named products is intended, nor is any criticism implied of similar products which are not mentioned.

All communications respecting advertising in the Journal should be addressed to the Advertisement Contractors, Cowlishaw and Lawrence (Advertising) Ltd., 2-4 Ludgate Circus Buildings, London E.C.4. Telephone: 01-248 3718.

The Electro-Agricultural Centre for all advisers

This Centre is a permanent part of the National Agricultural Centre at Stoneleigh. It affords a display of fundamental techniques in the use of electricity in agriculture, as well as providing conference and training facilities. In addition, there is a technical and product information library, and adequate provision for demonstrating new equipment.
This Centre has been established by the Electricity Council to help all concerned keep up to date with the latest electrical developments in agriculture. It operates in conjunction with the Demonstration Areas of the N.A.C. where electrical methods are widely demonstrated as part of the many new farming techniques.
Advice and information about electric farming methods is freely available from the full-time specialist staff in attendance. Facilities for training courses and conferences are available for use by recognised agricultural organisations. The Centre is designed to meet the needs of all sections of the agricultural industry and to assist farmers in their efforts to increase productivity and cut costs.

For further information contact your County or Regional Office, or Mr.R.G. Scott at the Centre.



The Electro-Agricultural Centre, Kenilworth, Warwickshire, CV8 2LS. Tel: Coventry 27338 or Telex: 31543

Issued by the Electricity Council, England & Wales

AGRICULTURE DECEMBER 1968

Calf Housing Studies

M. B. Helps, *High Mowthorpe Experimental Husbandry Farm*

MODERN systems of intensive livestock production tend to result in stock being concentrated in large units, which are operated by a minimum of labour. The effect of this, coupled with increased building costs, is that stock are being kept at greater densities in both new and adapted buildings.

This is particularly true in calf rearing where the adoption of modern rearing systems has resulted in large numbers of calves, drawn from a number of primary points, being housed under one roof in intensive units. The layout of these units has to be arranged so that feeding and management and subsequent cleaning out can be carried out with a minimum of time and effort. Everyone is agreed on this, but housing can vary enormously and still give satisfactory results if the management is right. When attempts are made to define the type of construction and equipment needed to give the best internal conditions of temperature, ventilation and humidity, the situation becomes very confused.

Specialized calf houses are available and many of these are called controlled environment houses. In practice, these are usually insulated houses fitted with a forced ventilation system which is thermostatically-controlled to provide automatic control of the ventilation rate and so, indirectly, control temperature and humidity inside the house. The degree of control is often imprecise, but variations in temperature will normally be less than in a non-controlled house and high humidity levels may be avoided.

It is extremely difficult to determine, from commercial records, the effect that these factors have on the health and growth of calves. The financial implications of sophisticated calf housing are also difficult to assess.

The basic problem is to find reliable evidence on which to base recommendations for calf house environments in this country. Published recommendations on environmental temperatures for calves are frequently based on investigations carried out in climates markedly different to that experienced in Britain. For example, a series of experiments in Missouri, U.S.A. show that calves respond better to temperatures of 50°F (10°C) than 80°F (26·6°C).

The value of this type of information also tends to suffer from a lack of definition of the age of the animals involved. The age of the calf undoubtedly has a bearing on the importance of temperature. Work at the Hannah Dairy Research Institute, Ayr, suggests that the temperature in a calf house should not be allowed to fall below 55°F (12·8°C) in early life but that by the time the calf is three weeks old it should be able to live and grow satisfactorily in temperatures down to 46°F (8°C). After three weeks the lower limit for satisfactory health and growth of calves might be even lower.

This type of result is of particular interest to the rearers of purchased beef calves which normally change hands when 7–10 days old. The temperature recommendations have a bearing on the optimum conditions for calves in transit and it also means that for most of the year the amount of extra warmth required by the calves is negligible.

Most advisory literature gives the most suitable range of relative humidity for a calf house as 75–80 per cent and, in fact, this is probably within the range of humidity found in many well ventilated calf houses without supplementary heat. Dutch work on veal calf housing suggests a relative humidity of 85 per cent at a temperature of 60°F (15·5°C).

There is little evidence to demonstrate the effect of ventilation at normal temperatures in the British Isles and there are wide variations in published recommendations. With a winter temperature maintained at 50°–60°F (10°–15·5°C) and an internal R.H. of 70–80 per cent the minimum airflow recommendations vary from 7–15 c.f.m. per calf and the maximum from 20–50 c.f.m. per calf. Very few authorities link positive recommendations to live weight of the calf.

It is therefore not surprising that the situation found on farms rearing calves is exceedingly confused. Some rearers claim to have achieved spectacular improvements in the health and performance of calves by changing from old makeshift accommodation to new fully insulated buildings with sophisticated environment control systems. Other large-scale rearers continue to get excellent results with very simple accommodation in adapted buildings.

The case for temperature and ventilation control is, therefore, far from proven. In an attempt to clarify the position two Experimental Husbandry Farms, Drayton and High Mowthorpe, started in 1964 to compare the performance of calves reared in a variety of houses.

At High Mowthorpe three types of housing have been compared:

A. Full insulated house with automatic control of ventilation and electric heating.

M. Partially insulated house with manual control of ventilation and roof insulation. No artificial heat.

S.B. Straw bale shelters in a covered yard.

Houses A and M were in an adapted building with 9-in. brick walls and an asbestos cement corrugated sheet roof. A total of 180 Friesian bull calves were taken into this accommodation in three intakes between September, 1964 and March, 1965.

In the house with automatic controls, thermostats were set to give a temperature of 55°F (12·8°C) for the first three weeks. They were then progressively lowered during the fourth week to give a temperature setting of 45°F (7·2°C) up to twelve weeks, when the calves were removed.

In the second house the variable speed fans were controlled manually to disperse condensation when this occurred or to conserve heat in cold conditions.

In the straw bale shelters conditions were completely dictated by external weather conditions.

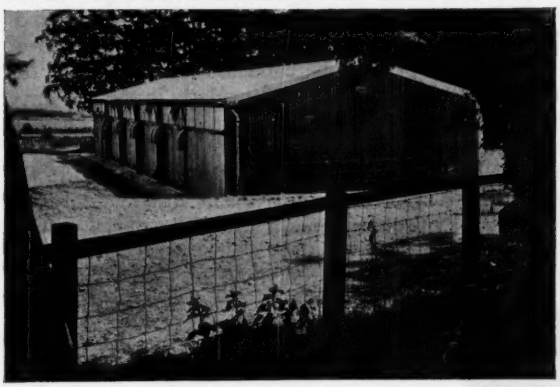
Temperatures in the manually ventilated house and in the straw bale shelters were generally about 12°F (6·7°C) lower than in the automatically controlled house between December and March, thereafter there was little difference. Minimum temperatures recorded in the manually controlled house and in the straw bale pens were 36°F (2·2°C) and 27°F (−2·8°C) respectively (December, 1964). No consistent relationship was found between the type of housing and liveweight gain. The relative performance of the calves in each type of house varied according to season of the year and, therefore, according to external weather conditions.

High Mowthorpe E.H.F.

Daily liveweight gain of Friesian bull calves (lb) arrival to 12 weeks

Intake	*House*		
	A	M	S.B.
September	1·26	1·23	1·32
December	1·30	1·09	1·12
March	1·51	1·51	1·40

Weather conditions were good during the rearing period of the September intake and consequently there was little difference in the performance of the calves in the three types of housing. During December, weather conditions were at times severe. There were also wide variations in humidity and under these conditions the calves in the insulated, automatically controlled house showed the best rate of growth.



Calf house at High Mowthorpe, showing inlets and outlets of ventilation ducts on north side, and slatted boarding of the non-controlled west end, of the house

The health of the calves could be considered as another measure of the efficiency of the housing, but no straightforward relationship was found between incidence of disease and any particular type of housing. In these experiments the calves in the manually controlled house were the least healthy in both the September and December intakes and any disease in this house was noticeably the most difficult to clear up.

Similar experiments have been carried out at Drayton Experimental Husbandry Farm with October- and March-born Hereford × Friesian calves. Trials were carried out in a converted wooden poultry house which was divided into four isolated compartments. Each compartment had

individual pens for fourteen calves. Systems of ventilation and temperature control were as follows:

F.H.A. Fan heaters with artificial ventilation.
U.H.A. Underfloor heating with artificial ventilation.
N.H.N. No artificial heating or ventilation.
F.H.N. Fan heaters but no artificial ventilation.

Both the fan heaters and the underfloor heating were thermostatically-controlled to switch off when the internal air temperature rose above the pre-set level. The artificial ventilation was provided by fans set manually according to outside air temperature.

Thermostats in the heated houses were set for 60°F (15·5°C) for the first ten days and then decreased by 5°F (2·8°C) every ten days until the houses were at ambient temperature.

Performance of the calves was as follows:

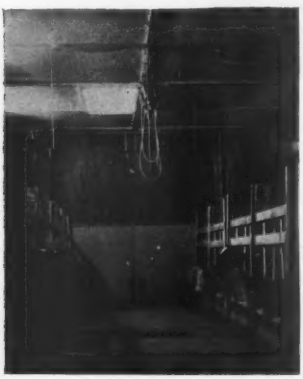
Drayton E.H.F.

Mean daily liveweight gain Hereford × Friesian bull calves (lb)

Intake	*Housing*			
	F.H.A.	U.H.A.	N.H.N.	F.H.N.
October	1·7	1·6	1·4	1·5 (Arrival to 11 weeks)
March	1·2	1·1	1·1	0·9 (Arrival to 8 weeks)

In the October trial calf health was good and the gains were satisfactory. The best liveweight gains were in the houses getting extra heat and artificial ventilation, but there was no indication that the treatments had improved the efficiency of food conversion. In the early stages of the trial, the provision of supplementary heat appeared to give a slight improvement in the rate of liveweight gain. In the later stages of the trial, condensation occurred in the compartments without artificial ventilation and particularly in the last three weeks of the trial, the calves in the naturally ventilated compartments had an inferior rate of liveweight gain.

Liveweight gains were lower in the March intake. Salmonellosis affected the liveweight gains of several calves in all compartments although only two deaths occurred. A combination of supplementary heat and artificial ventilation gave improved performance up to weaning, which was at five weeks, and no condensation occurred in any compartment.



High Mowthorpe calf house showing ventilation control equipment, thermostats and ventilation duct above individual calf pens

The effect of calf rearing on subsequent performance has been investigated in one group of calves at Drayton. On normal feeding there was little difference in rate of growth between twelve weeks and slaughter, but with animals finished intensively there was some slight evidence that the effects of temperature and ventilation in the early stages of the calves' life were carried through to slaughter.

Although on some occasions during these trials extra warmth has given better calf performance, the conclusion reached so far in this work is that it is difficult to justify elaborate or sophisticated housing for calves purchased in any but the severest winter weather conditions.

Commercial rearers of purchased calves must ask themselves if they really need to purchase calves in the December-February period when severe weather is likely to occur during rearing. If this period can be avoided, then provided ventilation is adequate to disperse foul air, sophisticated systems of environment control are not required.

If all-the-year-round intakes are envisaged the ideal environment equipment needed will depend on the age of calves to be housed. Very young calves will benefit from extra warmth in midwinter. For purchased calves coming on to the farm at 10–14 days old ventilation may be more important than warmth. If ventilation rates are high air movement must be arranged to avoid draught.

Drayton and High Mowthorpe have now been equipped with specialized environment houses designed to provide facilities for experimental work aimed at defining the best environments for young calves. These buildings provide five separate compartments, each containing individual pens for twelve calves. Four of the five compartments in each house are fully insulated and are equipped to give a high degreee of control over the environment within the compartment. The fifth compartment in each house is subject to fresh air conditions and provides a control treatment in environment experiments.

The first series of experiments in the new house at High Mowthorpe compared the effect of two levels of temperature on the performance of purchased calves from 7–10 days old up to eight weeks. Interim results suggest that within the range 45°F (7·2°C) to 65°F (18·4°C) temperature has little or no effect on health, liveweight or food consumption.

It is planned to continue this type of work at both Drayton and High Mowthorpe to obtain more detailed information on the most suitable environment for young calves. With the equipment available, it is hoped to study the value of extra warmth provided in cold, severe conditions and also the effect of ventilation in warmer weather. The importance of a hardening-off period for calves from artificial environments will also be considered.

The problems involved in designing a calf house which provides, at an economic cost, the best possible environment for young calves at all seasons of the year is still far from solved. On a basis of the information available at present, the commercial rearer of purchased calves must consider very carefully when investing in specialized buildings. It may well be possible to obtain good results without elaborate environment control equipment if the following points are borne in mind:

1. Any calves purchased in the December-February period will have to be reared during the severest weather of the winter.
2. Strong calves will be easier to rear than very young or small poorly-developed calves.

A. J. C. Beaumont
discusses the economics of loose housing versus kennel housing for dairy cows

Housing for Dairy Cows

WHEN choosing a system of housing for dairy cows it is important to compare not only the initial cost of building but its annual cost, such as the expenses of feeding, mucking out and cost of storing feedingstuffs and bedding. This article illustrates how such costs may work out for a sixty-cow dairy herd housed in two different ways. One consists of loose housing with a 60 × 30 ft Dutch barn storing hay and straw with a 30 ft wide lean-to on each side of the barn. Feeding would be along each side of the barn. The other system consists of a Dutch barn 45 × 25 ft for hay storage—straw bedding is not needed on this system—with 60 kennels and a covered feeding area. The assumption is made that both buildings are erected on clear sites and both include an existing self-fed silo, parlour, etc.

Capital costs

Whilst in practice these vary considerably, dependent on site, degree of mechanization, materials used and so on, the examples have been worked out on average—and more important—comparable figures.

Example costs for each system based on farm labour:

Loose housing	£	**Kennel housing**	£
Building 5,400 sq. ft at 9*s.*	2,430	Kennels supplied including feed area and mangers	1,566
Cladding 85 sq. yd at 25*s.*	106	Erection (F.L.)	150
Gates, 4-sheeted	60	Concreting + foundations	250
Block walling and foundations	225	Dutch barn, 45 × 25 ft at 10*s.* per sq. ft	562
Mangers and racks	240	Cladding 45 sq. yd at 25*s.*	56
Lighting PC sum	30	Lighting PC sum	30
Water PC sum	30	Water PC sum	30
Concreting (optional)	50		
	3,171		2,644
Less grant 25% + Investment grant 5%	951	*Less* grant 25% + Investment grant 5%	792
	2,220		1,852

Whilst the above represents the *initial* capital costs, the finding of which in the first instance, may well be an important factor, it is the annual charge or the equivalent annual cost as it is sometimes called, which should be an equally or more important consideration.

Permanent building charge

The costs are those which do not change from day to day. They are made up of the cost of maintenance and insurance, plus the cost of writing off the capital and the payment of interest on that capital.

Insurance and maintenance costs will be less for the more substantial loose housing building than for the kennels.

Possible figures are:

		£
Loose housing	Maintenance 1% on £2,220	22
	Insurance 3*s.* per £100	3
		25
Kennels	Maintenance 2½% on £1,852	46
	Insurance 4*s.* per £100	4
		50

Costs involved in writing off the capital and the interest on the capital can be worked out in many ways. Whichever method is used, however, the length of write-off period is the overriding factor and this must depend both on the economic life as well as the structural life of the building. A covered yard would normally be written off over fifteen to twenty years, whereas the life of kennels is not much longer than ten years. A comparison may be made using the same write-off period for both buildings and then allowing for the fact that, in the case of the kennels, the major part of the improvement is then lost, whereas the covered yard would still have a considerable value.

A simple way of assessing the annual recoupment and interest charges is by the Annuity System used by the Agricultural Mortgage Corporation and the Building Societies. By this method, the recoupment of the original sum invested and the paying-off of interest charges, are combined into a fixed annual sum. This sum amounts to £149 per £1,000 borrowed for ten years at 8 per cent, which in this instance means:

Covered yard—Fixed annual sum of £330 on £2,220 invested
Kennels—Fixed annual sum of £275 on £1,852 invested

Therefore, inclusive of upkeep costs, the total annual building charge for the covered yard system amounts to £355; for the kennels it totals £325. At face value, the kennel housing is £30 cheaper per annum.

But let us look at this again using the correct write-off periods for both buildings, i.e., ten years for the kennel house and at least 15 years for the covered yard. This gives a reduced fixed annual sum for the covered yard of £259 (the Agricultural Mortgage Corporation's fixed annual charge being £117 per £1,000 value for a write-off period of 15 years at 8 per cent). Inclusive of the annual upkeep cost of £25, the total annual building charge is £284, which is £41 less than that of the kennels system.

Annual variable costs

The annual building charges are not the only considerations, as the annual variable costs have also to be taken into account. A building with a low annual building charge might be far more expensive to run daily than one with a higher charge, due to greater variable costs. These costs are now considered.

It is difficult to assess these costs as they vary a great deal according to management. The figures given are suggested average costs for various jobs carried out in the daily running of the unit.

Cost of litter. The main advantage of kennels is the fact that the cows need little bedding. The cost of their straw or sawdust can be as little as £25–£30 per annum, whereas the cost of bedding used in loose housing can be quite costly. This varies according to:

1. Whether or not the litter is home-grown or bought. The cost of baling, carting and storage of home-grown straw should not be rated at much more than £3 per ton, but if purchased at harvest time the cost might be £4–£10 or so, according to the area. For example, straw in Devon was reaching £12 10*s.* per ton last winter.
2. How well the cows are bedded. One cow uses on average 15–20 cwt in winter, yet many farmers get away with less.
3. There are also a number of minor reasons, such as distances of carting and whether or not the straw is needed for some other use.

Assuming 15 cwt/cow/winter—

=45 tons at £4 10*s.* = £202

Time taken to bed cows down. The time involved varies according to the layout and if a tractor or trailer is required. For example, the time can alter according to the situation of the straw relative to the bedded area and the number of times the cows are bedded per day or per week.

Taking the layout described, no tractor or trailer is required and so the time taken is at a minimum. It is that required to throw the bales into the lying area and spreading. This takes one man about one hour per day.

With regard to bedding the cows in the kennel house, the time taken is quite small, and in practice only carried out once a week or so.

Labour to feed hay. Again this depends on the initial design. It obviously takes longer to feed in the kennel house than the loose housing system as either a tractor and trailer or a link box is required to cart the hay from the Dutch barn to the racks. Even if they are not used there is far more movement. This could well be 1½ hours per day, plus cost of tractor.

In the loose housing system there is a small amount of hand carting; for this allow one man, half-hour/day.

Daily cleaning down. This can be disregarded as in both systems the loafing, collection and dispersal areas have to be cleaned daily and so the time taken to scrape the internal passages of the kennel house more or less counter-balances the time taken to scrape the end strip of the bedded area.

If there is no concrete feed strip in the bedded area then one would have to include an extra time for the cleaning out of the kennel house. This could, however, be counteracted by the increase in amount of straw used.

Mucking out. With loose housing the time taken can vary a great deal but considering the system whereby two men annually muck out and spread on the land without any heaping, this would involve two men, one week's work, including two or three tractors.

Kennel housing can cause considerable slurry problems and there are a number of different ways of dealing with them. For example, slurry scraped into a spreader and spread daily: slurry put into a pit holding a week or a month's supply and then spread by means of a tanker or irrigation: slurry put into a lagoon: by adding a straw to make farmyard manure.

However, there is not the scope here to develop this theme which is a subject in itself, but whichever method is chosen it is generally far more expensive than dealing with F.Y.M. from the loose housing system. Taking the cheapest system of spreading every day this amounts to about three-quarters of an hour labour and the cost of a tractor each day.

With regard to the daily labour requirements, this clarifies a point which is often neglected. By using kennels, the time taken to litter the cattle is greatly reduced, but this is often set off by the extra time taken to feed the hay, thus producing the same labour requirements per day for each system.

Conclusion

All the above costs indicate that it is not possible for anyone to state categorically that one system is more economical than the other. The answer is tied up with existing buildings and fixed equipment, the farmer's personal management programme, the type of farm and the number of ancillary enterprises between which capital costs can be shared.

The effects of taxation and taxation allowances also have to be borne in mind. These vary according to the financial circumstances of the individual concerned, and may well influence his final assessment of the economics of each system.

I feel that with regard to the annual running costs there is a slight saving in the kennel housing system. But it is largely dependent on the relative cost of straw, compared to that of the capital and annual fixed costs of the slurry handling equipment. The cost of these two items can alter according to the topography of the district and could show a great deal in favour of either system to the extent of altering one's choice.

It is, however, up to the farmer himself, or his advisers, to analyse each individual building problem on his own farm before deciding which system to adopt.

A. J. C. Beaumont, M.R.A.C., was, until recently, a member of the Ministry's Agricultural Land Service in Devon. He is now an Assistant Land Agent in private practice.

Oxford Farming Conference

The theme for the twenty-third Oxford Farming Conference, to be held in the Town Hall, Oxford, from 6–8th January, 1969, will be **Deficiency Payments–or What?**

The programme and full details are obtainable from the Hon. Secretary, M. H. R. Soper, O.B.E., Department of Agricultural Science, Parks Road. Oxford, OX1 3PF.

Intensive Rearing of Store Cattle

W. D. Griffiths F. W. Keighley

WHEN high gross margins from grassland are considered, many farmers—and their advisers—automatically think in terms of the dairy cow as being the only means to achieve this end. Generally speaking, this is correct, since gross margins from dairying tend to range from £45 to £55 per acre compared with rearing and fattening in the £15 to £25 per acre range. In view of this, it is felt that the margins obtained from store cattle rearing by Mr. Len Lister of Fields Farm, Rossett, Wrexham, Denbighshire, will be of interest to everyone concerned with the intensification of grassland production.

The economy of the 120-acre holding is based on a Friesian/Ayrshire herd of 65 dairy cows which, by the adoption of high nitrogen usage on the grassland for grazing and conservation, is kept on 90 acres of grassland to give a stocking rate of one cow per 1·38 acres. The margin over feed and fertilizer expenditure from the land devoted to the dairy herd is well above average at £80 per acre.

To improve profitability, the obvious policy to adopt would be to increase the dairy herd to about 100 cows, but this would mean considerable capital expenditure in terms of a herring-bone parlour, together with additional silage and cubicle accommodation. This would, in fact, pay off very well but at the present time Mr. Lister does not wish to commit himself to the additional capital investment involved.

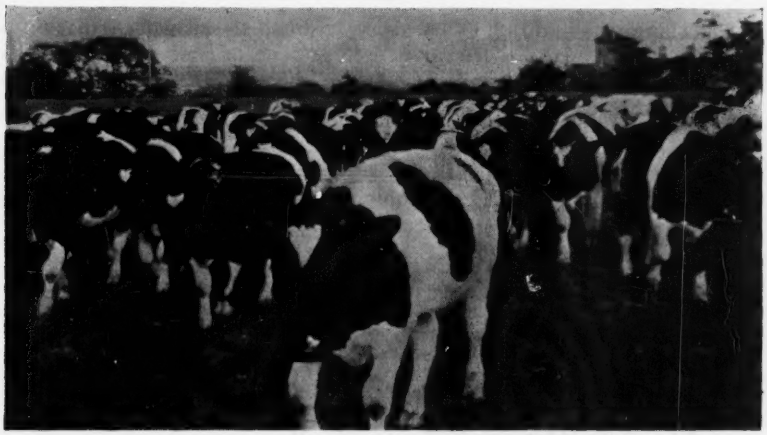
Use of available land and buildings

In considering the various possibilities for using the acreage not required by the cows, high return cash crops were ruled out, due to labour shortage, and cereals were a doubtful starter since, when harvested by contract, gross margins are in the £25–£30 range, which Mr. Lister considered to be too low. Buildings, apart from the accommodation required for calf rearing, are restricted at Fields Farm which means that any livestock kept would have to be sold before the second winter. Having prepared some budgets, Mr. Lister felt that rearing autumn-born calves for sale as stores at twelve months of age would show a reasonable margin and still fit in with the overall pattern of the farm.

Accordingly, 55 Friesian steer calves were purchased direct from farms through Select Livestock Producers Limited, in two batches in October, 1966, and were made up to 57 by the inclusion of two Friesian steer calves from the dairy herd. The average weight of the calves was 108 lb.

Feeding

A batch of 31 calves was reared in a converted deep litter house in groups of three and the remaining 26 in a converted shippon in single pens. On arrival, they received a feed of 3 oz of glucose, plus a sprinkling of milk



Mr. Lister's store cattle as seen by Mr. Keighley prior to being sold

powder in 1½ pints of water, which was gradually increased, so that by the fourth day after arrival they were on full rations. The batch in the deep litter house was fed high fat milk substitute twice daily but the batch in the shippons was only fed once a day. Calf rearing pencils, good quality hay and water were on offer to both groups from the time of arrival. The calves kept in groups of three appeared to thrive better than those in single pens.

After weaning, the calves in the deep litter house were run as a single group in a shippon and those reared in the shippon in single pens were run on in the same building as a group by removing the pen divisions. The diet was gradually changed over to one consisting of barley and a protein balancer in a 6 : 1 ratio fed up to a maximum of 7 lb per head per day at turn-out to keep the calves in a good growing condition rather than allowing them to put on too much flesh. No roughage was fed but the calves could pick over the straw on which they were bedded down daily.

As a precaution, the calves were dosed for husk in January and March and were turned out to grass on 1st April. Barley was fed at 3 lb/head per day for ten days after turning-out; after that the diet consisted entirely of grass.

In total, the cattle grazed on 28 acres of land in four fields (divided into five paddocks) but some of the acreage was cut for silage and grazed by the dairy herd.

Field A	10 acres	Ryegrass/timothy. Sown 1966
	Treatment	Grazed by 65 cows for 6 days in April
		Cut for silage in June
		Cut for silage in August
		Regrowth grazed by calves in August/September
Field B	8 acres	Permanent grass
	Treatment	Grazed by calves only
Field C	5 acres	Ryegrass/timothy. Sown 1966
	Treatment	Grazed by calves only
Field D	5 acres	Ryegrass/timothy. Sown 1966
	Treatment	Cut for silage in June
		Grazed by calves

Allowing for the grazing by the dairy herd and the silage cuts that were taken, it is calculated that the calves used 18 acres of land. Fertilizer applications amounted to 290 units of nitrogen, 40 units of phosphate and 40 units of potash per acre on the leys and 185 units of nitrogen, 40 units of phosphate and 40 units of potash per acre on the permanent grass.

Results

Physical performance per beast	lb
Live weight at purchase	108
Live weight at turn-out	353
Live weight at sale	678
Winter liveweight gain	245
Summer liveweight gain	325
Daily liveweight gain at grass	1·72
Liveweight gain per acre (after deducting barley fed at grass)	992

Financial performance	£	*s.*	£	*s.*
Sales: Calf sold February, 1967	32			
Stores (56)	2,665			
Calf subsidy 56 x £10 5*s.*	574		3,271	
Less: Purchase of calves	705	17		
Value of 2 calves from dairy herd	25	13	731	10
Output:			2,539	10

Variable costs	£	*s.*	*d.*	£	*s.*
Feed: Milk substitute 11 cwt	76	2	6		
Calf rearing pencils 56 cwt	108	10	0		
Protein balancer 75 cwt	183	14	6		
Barley 450 cwt	503	13	0	872	0
Medicines: Husk	75	10	0		
Worm	28	0	0	103	10
Fodder: Hay 1 ton (purchased)	10	0	0		
Straw 20 tons (purchased)	100	0	0	110	0
Forage costs				220	0
Miscellaneous				56	0
				1,361	10
Gross margin				1,178	0
Gross margin per acre (18 acres)				65	10
Gross margin per beast (57)				20	13

The prime consideration in the management of the grassland was to have a plentiful supply of young, leafy digestible grass, palatable at all times, for the cattle to graze. The cattle were grazed on the four to five acre paddocks for four to six days, depending on the amount of grass available. Fields B and C were topped twice by the forage harvester and field D once. Fertilizer was applied after each grazing and in the case of fields B and C, which were grazed by the calves only, six dressings were given.

The cattle were dosed for worms in mid-May and mid-July and were sold by weight on 7th October, weighing just over 6 cwt per head.

As an indication of the high overall standard of management, no calves were lost, but one was sold in February, 1967, to make up a load of weaned calves.

Store rearing is generally considered to be an enterprise not worth contemplating in comparison with other alternatives, particularly on the lowland farm.

However, with good stockmanship, good grassland management and a high stocking density, Mr. Lister has shown how this particular store-rearing enterprise has been integrated into the overall pattern of his farm and has made a very useful contribution to farm profits without any capital expenditure on buildings or fixed equipment.

This article has been contributed by **F. W. Keighley, N.D.A., N.D.D.**, who is a District Agricultural Adviser with the N.A.A.S. His co-author, **W. D. Griffiths**, is a Livestock Husbandry Adviser also with the N.A.A.S. Both authors are stationed at Ruthin, Denbigh.

Storage of Pesticides

Careless storage of pesticide products can lead to accidents. Now that the main spraying season is over, users should take stock of the chemicals they have left. Full and partly-used containers should be stored under lock and key away from food, feedingstuffs, seeds and fertilizers, and where neither children nor animals can get at them. Care should be taken to see that the containers are tightly closed, that they do not leak, and that they are clearly and indelibly marked to show what they contain.

Surviving the Egg Price Squeeze

J. Halliwell

WHERE do we go from here? is the question a lot of egg producers have been asking themselves during the past few months. Many are losing money, and others are working all the year round only to find at the end that they have just about broken even. They would get out of egg production if they could, but this would mean expensive plant and equipment lying idle.

Many of these producers believed themselves to be among the most efficient in Britain, and thought that they would be the last to go out of business if times became hard. They prided themselves on their management, they put up the latest controlled environment houses, bought the best pullets, fed the highest energy food and obeyed all the Egg Board's rules. They have waited patiently, without avail, for virtue and toil to be rewarded. How disillusioned many of them must be!

Where have they gone wrong? It is, of course, easy to say that they have all gone wrong in collectively expanding production to a level which has brought prices down to a point where margins are non-existent. This does not, however, bring a solution.

What can help? Firstly by way of encouragement, it is as well to point out that not all egg producers are losing money. Some are still making worthwhile profits of 5*s*., 6*s*., and even 7*s*. a bird, which many people would say was remarkable if not miraculous.

There are many factors which have enabled these people to keep in business. Below, I have tried to list them into the choices facing the producer who is determined to stay in business, whatever the competition.

(1) Production per bird. This is still the main factor in determining overall profit. No matter how low the costs, it is difficult to break even if production level is less than about 230 eggs per bird at present day prices. Of course, the 'mammoth' producers can withstand lower production because their costs are on a completely lower level. Their sort of massive cost-cutting is just not possible for the average producer, who must therefore rely on his better management to give him those extra eggs which make all the difference.

(2) Better egg prices. Apart from a staggering reversal of the present supply and demand situation, there are only two or three ways in which the average producer can hope to get more for his eggs. The first and most

obvious one is to retail some or all of them. However, if this involves an egg-round, it is important to remember to add the 6*d.* or 8*d.* a dozen increased costs that this will involve in transport and labour.

The time of year the pullets were hatched can have a big influence on the return for eggs. If the present egg price pattern continues, it looks as if early spring hatched birds will continue to be the most favoured.

Better grading returns will also obviously give a better egg price, but there is little the average producer can do to achieve this once his birds are in lay. Feed has some influence on egg size, but grading returns largely depend on the breed chosen, the age at first egg, and particularly the incidence of respiratory diseases during the growing period.

Bigger case-bonuses are an obvious aim of all producers, but equally obviously there is a limit to what egg packers can give.

(3) A better return for the end of lay bird. This again is only a limited possibility. It would not be feasible for most producers to pluck and dress large numbers of hens at one time. However, in some areas where there may be a ready sale for dressed boiling fowl at certain times of the year, the acquisition of a deep freezer may be worth while, particularly if the processing of the birds can be done by a contractor.

There is one other way in which some producers can get more for their 'end of lay' birds. This is by advertising them in the local paper and selling them live to domestic and small farm flock producers. This does give an odd shilling or two more per bird. It can be a double-edged sword, however, if enough producers do it, in that buyers of eggs are tempted to become potential producers, and so add to the national over-production problem.

(4) Selling the by-products. With battery layers, there is only one by-product—hen manure, and selling this in most areas is extremely difficult. Of course, if it can be dried and put into a more marketable form this is a different matter, but drying plants cost upwards of £3,000–£5,000 and it is highly likely that dried poultry manure is one of those products which can only be marketed on a national scale by big companies.

(5) Cutting food costs. Here is one of the major factors which influences profit or loss. It can be achieved in several ways; cutting down wastage is an obvious one and the remedy equally obvious.

The type of bird chosen will influence greatly the producers' annual feed bill and in those areas of the country where compound feeds are expensive due to transport costs, small turnover, etc., it will probably pay producers to choose the very light hybrid bird, which eats less food. Daily consumption figures as low as 3½ oz per bird are claimed for some breeds.

Insulation of poultry houses also plays a part in cutting down the amount of food used, and in some cases this point could be looked at.

Cutting the cost of the food itself, however, is the most likely avenue for improvement. Many producers still pay far too much for their feed, and as prices are rising, due to devaluation, it is more than ever imperative that they 'shop' around to obtain the largest discounts.

Home-mixing seems to be on the increase and rightly so, since there is no mystery attached to the feed requirements of the laying hen, and it is possible to save as much as £5 a ton over the cheapest compound feeds in certain areas. We may well see a return to rations based on barley and wheat now that devaluation has increased the price of maize, and this may benefit producers in barley and wheat-growing areas.

It is worth while pointing out that a saving of £6 a ton on feed prices is equivalent to about 3*d*. per dozen eggs, or 5*s*. a bird.

(6) Pullet depreciation. This is the other major cost and it is significant that most of the producers still making a profit either home rear their birds or buy them in at very keen prices. It is certainly very difficult for producers buying in point of lay or so called point of lay pullets for upwards of 16*s*. 6*d*. each and then having to sell the end of lay bird for around 2*s*., to make a worthwhile profit these days, however high the production level.

Mortality levels obviously influence the amount of pullet depreciation, but again there is little the average producer can do about it once his flock is established. If one has to buy in at point of lay, then it is advisable to choose the rearer before the breed. The proficiency of the rearer can make or break the laying flock's performance.

These then are the major cost and return factors which influence profitability. Other costs such as labour, and building and equipment depreciation are not so vital, although obviously they must be kept to a minimum. Paid labour should not be costing more than about 3*s*. 6*d*. per bird or 2*d*. a dozen maximum. In an attempt to keep in business the producer must look at these items very closely and see where they can be improved.

Other recipes for survival are sometimes suggested, however. Keeping second-year birds is one and this has distinct possibilities provided the birds are force-moulted first. This should preferably be done during the spring when prices are low and, contrary to some opinions, can be successfully carried out in cages. The feathers may constitute a major nuisance, but can be coped with. The cost for whole non-productive moulting period should be under 3*s*. a bird. It is important to emphasize, however, that the management of a flock to be force-moulted must be top class. The object must be to get all the flock into a moult as quickly as possible by correct control of food, water and light for a few days, and then to get the birds back into lay at the earliest date. Within seven weeks the birds should be beginning to pay for themselves again. High production figures are possible in the second year and although the birds eat more food this should be more than made up by the better egg size.

A return to so-called scavenger flocks is sometines advocated as a cheap way of producing eggs on the general farm. This picture of hens stealing their keep from the farmyard grain store is attractive, but not really feasible.

The only other possibility open to producers is that of expansion of their flock size. This is the time-honoured business method of combating smaller profits by increasing turnover. However, it is obviously this principle that has got the industry into the poor state that it is in at the moment, and as profits are non-existent for many producers, there would seem to be no point in expanding. Look for ways of cutting costs and increasing returns first.

Whatever decisions the Government has taken, or has yet to take, on the recommendations of the Reorganization Commission for Eggs, any method of egg marketing is not going to alter the basic economic law of supply and demand, however, and there seems little prospect of a big improvement in egg prices coming along.

The independent small or medium-sized producer will just have to use this independence to advantage by perhaps rearing his own birds and mixing his own feed, allied to his management skill in getting better production, and possibly retailing part or all of his eggs. However insecure his position is in the industry, he has the advantage of flexibility and some small changes in management could be sufficient to extend the period in which his unit will remain viable.

This article has been contributed by **J. Halliwell, N.D.P.**, who is County Poultry Husbandry Adviser for the National Agricultural Advisory Service for Carmarthen and Pembrokeshire.

Establishment of a Livestock Improvement Committee

The Royal Agricultural Society of England has established a Livestock Improvement Committee under the Chairmanship of **Lord Crathorne** to report with the following terms of reference:

(*a*) To assess the potential value of the competitive livestock classes at the Royal Show.

(i) in current and future breed and livestock improvement;

(ii) in relation to commercial objectives and

(iii) in providing conditions which may aid livestock export.

(*b*) To recommend the broad changes of policy which may be necessary to bring about these objectives.

The first meeting of the Livestock Improvement Committee was held on 23rd October, 1968, and consists of:

The Lord Crathorne, Chairman

Dr. H. K. Baker, Meat and Livestock Commission

Mr. R. Dunlop, Breeder, Castle Douglas

Mr. A. A. C. MacArthur, Hon. Show Director, Royal Agricultural Society of England

Dr. K. O'Connor, Geneticist, Milk Marketing Board

Mr. Frank Sykes, Farmer, Wiltshire

Mr. Christopher Dadd, Secretary and Technical Director, Royal Agricultural Society of England

Mr. T. J. Colwyn David, Regional Livestock Husbandry Adviser, N.A.A.S., and Technical Secretary to the Livestock Improvement Committee

The Committee will be writing to seek evidence from representative organizations and specialists in the livestock field. In addition, it welcomes a written summary of views from individuals or other organizations, not later than the end of February, 1969. A series of meetings in different parts of the country will be held to hear evidence and views. The venue of such meetings will depend on the preliminary evidence and views, expressed in writing to the Technical Secretary, Livestock Improvement Committee, Royal Agricultural Society of England, 35 Belgrave Square, London, S.W.1.

The Committee will be expanded by the addition of up to four prominent breeder members representing each of the species, cattle, sheep and pigs when their respective interests are being considered.

Progressing to Metric

J. B. Freeland

THE change to metric is 'going to shape the future of our society, the future of our economy', said the Ministry of Technology last July, when the programme for the change-over to metric in the engineering industry was published. These are stern and indeed serious statements and when fully considered should call for some inquiry from us all as to what is meant.

Engineering is the second of the large industries to receive the Government's backing to its change-over programme since May, 1965, when the decision to 'go metric' was formally announced in Parliament. Unlike the previous attempt in 1871 when the Bill to change to a metric system was defeated in Parliament by only five votes, the proposals this time have been promoted by industry itself, and from statements made in Parliament the Government's function is not to impose a final date for metrication in industry as a whole, but to support each industrial sector in carrying out the conversion programme which it proposes for itself. It has been formally announced, however, that the transition period should, if possible, be completed within a period of ten years. By 1975, therefore, we should find that the metric system will become the primary system used in industry.

There are many people who disagree with the change and consider that it is an unnecessary expense which the country can do without in these times of financial stress, but on reflection it will be seen that this country's programmes are taking place at a crucial time in so far as metrication itself is concerned. Maybe this is confirmed by the action of many other countries who are also showing their interest in adopting a metric system. Since Britain declared its intention to go metric, Canada, Australia, New Zealand, Eire and Kenya have followed suit.

About 85 per cent of the world population is at present employing a metric system, and these countries themselves are in a state of change owing to the differences between them in their own systems. This is due to the range of rationalized metric units which have been decided following the International Agreement on metric units—the Système Internationale d'unités—(S.I.

Units). This country has adopted this system which is a collection of units and preferred multiples and sub-multiples derived from six basic units, the metre, kilogramme, second, ampere (for electric current), kelvin (for absolute temperature), and the candela (for luminous intensity). There is a wide range from which the particular technologies can choose in regard to the multiples and sub-multiples of the S.I. units and their derivatives. Discussions are at present taking place in both this and other European countries as to the application of these units. It is good to note that Britain is way ahead in this respect and is being closely watched by the rest of the world.

The implications of adopting S.I. units is, however, presenting several difficulties, the major one being with manufacturers who are already producing goods in metric dimensions and who are now being pressed to change again to producing goods to the S.I. unit sizes.

While the engineering industry is only launching forth into its change-over, the programme for the change in the construction industry is well under way. Both these industries, together with the non-industrial sector, affect the agricultural industry, and it is worth a quick study of their programmes, especially that of the construction industry agreed in 1967, to see the effect that the change will have from an agricultural point of view.

As with any change of this type when the basic factors have been altered it is necessary to revise the written word first, and 1968 has been the period in the construction industry programme when the majority of this preliminary work has been done. The revision of the relative British Standards to metric dimensions has been a vital major task. About 1,300 important specifications are involved here and amongst them about 500 are regarded as key standards. It is proposed to have these completed by the end of the year which will enable the change programme to proceed a step further.

The programme has entailed the complete revision of measuring instruments and tools all calibrated in metric terms, which it is hoped to have completed by January, 1969. It is after this date that designers and quantity surveyors have been given three years during which they are to effect the change-over in the production of drawings and documents in metric terms. The new British Standard for measuring instruments is now in draft form and is keenly awaited so that professional staff can be re-equipped with the 'tools to do the job' when it starts next January.

After January, 1970, most manufacturers should be producing for use in the agricultural industry components which have been designed to the new metric standards and which in most cases will also be dimensionally co-ordinated. We will be experiencing a three-year transitional period during which some products, which will have been co-ordinated in metric terms, will be in use together with other products which will still be in their present sizes but expressed in metric units. Added to this somewhat difficult period will be the fact that the engineering industry metric change programme will be behind that of the construction industry, and this in itself is sure to lead to many complications in the field of component production.

It will be seen, therefore, that the construction industry programme is, in fact, achieving a double change; the adoption of the metric system to S.I. units, and the application of dimensional co-ordination in buildings which is taking place as an integral part of the change. It is this latter aspect of the change-over that is proving to be the most difficult to complete and indeed to understand in all its implications.

Dimensional co-ordination can fairly be described as the provision of suitably preferred dimensions for buildings which will result in a reduction of the variety of sizes to which components will have to be manufactured. This will enable architects to prepare designs in such a way that builders will not have to carry out further modifications to components on the building site. No longer will we see components such as doors and windows being fitted together on the site by craftsmen. This is already being achieved to a great extent by the factory-built sectional type of structures which are being used to an increasing extent on farms these days. But in future the builder's task will be even more simplified.

The co-ordination of the components and of those of the buildings incorporating them has been the subject of investigation for many years now, and a recent publication in 1966 of a national standard for dimensional co-ordination was the result of a study carried out by a team representing fourteen countries.

The first steps in providing recommendations for the co-ordination of dimensions in building were taken when British Standard 4011 was published in 1966 and which laid down the basic sizes for building components and assemblies. This is the vital standard which now reduces the number of sizes that can be used, and the application of these new standards will greatly assist in the more economic manufacture of such products.

Last July the publication of B.S. 4330—'The recommendations for the co-ordination of dimensions in building-controlling dimensions'—provided a dimensional framework which can be used for the derivation of the basic sizes of dimensionally co-ordinated components. The framework is based on those horizontal and vertical dimensions in building which derive from user considerations and in turn influence the sizing of components and assemblies.

As mentioned in the British Standard, the ultimate aim is the maximum use of standard components, but this is only likely to be achieved if manufacturers and designers select from the resultant standards for metric dimensionally co-ordinated components.

It will be seen, therefore, that those employed in the design of farm buildings and the like will have a responsibility here to co-ordinate our designs to the dimensions laid down by this British Standard.

Members of the agricultural industry will wish to know how their interests are being taken care of during the change-over in the construction industry programme. The British Standards Institution is the co-ordinating body for all preferred dimensions and has the responsibility for negotiations with the respective branches of industry. It is in the hands of the B.S.I. to see that there is adherence to the change-over programmes.

To achieve their work, different functional group panels have been established to deal with 1. Structures; 2. external envelopes; 3. internal subdivisions; 4. services, and 5. fixtures and internal fittings. The Agricultural Land Service and the Country Landowners' Association are represented on all these panels in respect of the preferred dimensions required for components related to agriculture. The initial work of functional group Panel No. 1 has resulted in the publication of British Standard 4330 which provides us with the preferred dimensions in agricultural buildings for floor to ceiling and roof heights; for instances where changes in level take place; for width of zones in respect of columns and load-bearing walls and the preferred heights for window sills.

The preparation of these preferred dimensions calls for particular attention where agriculture is concerned as compared with components for the non-agricultural sector. The differing sizes of breeds and ages of livestock present additional complications in this respect.

In the long term, the advantages of changing over to a metric system and of applying dimensional co-ordination is greatly in favour of the country's economy. Whilst the initial cost will be tremendous we are told that the benefits derived will far outweigh this. The production of standard sizes for components will reduce manufacturing costs but the benefits will depend on the degree to which manufacturers accept the metric dimensionally co-ordinated standards.

Traditionally, it has been the practice to design a building and then to find the desired components that suit the particular design, but in future, if we accept the standards for dimensional co-ordination, it will be possible to ensure that the components will coincide with the design. It is through this that it is hoped to achieve the interchangeability of components, with a reduction in labour costs and erection time. One would like to hope that as a result of these methods the costs of some of our agricultural buildings of less complex design will not follow the cost spiral which has been experienced in recent years.

It will be seen that the adoption of the metric system is in itself only a small problem compared with that of applying dimensional co-ordination. It is, however, the acceptance of a system where units are sensibly related, which has been completely lacking with our imperial factors in the past. Besides the simplification of mathematics the adoption of universally accepted standards should be of considerable benefits to industry in the export field, since the dual production of goods will be reduced.

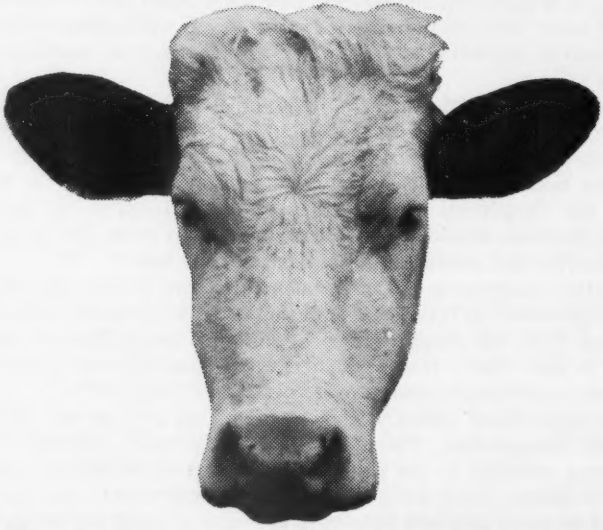
The actual change-over to the use of metric terms in the consumer sector is not programmed to take place until the industrial programmes have been completed. With the change to decimal currency taking place in February, 1971, it is most likely that we shall see the non-industrial sector of the community achieving its change-over between 1971 and 1975.

In the agricultural industry the success of the change will depend on everyone's co-operation. There will no doubt be many difficulties at first in adapting ourselves to the new conditions and to calculating such items as seed dressings, yields, animal rations etc., in metric. On the other hand, there will be many who will bless us in the years to come for having applied dimensional co-ordination, and for providing farm buildings which can be more easily adapted and expanded.

This article has been contributed by **J. B. Freeland, A.R.I.C.S.**, who is a Senior Assistant Land Commissioner with the Agricultural Land Service in London.

'Cattle really like Beet Pulp'

-reliable source



Sugar Beet Pulp mixed with barley is a better feed than barley alone

See us on stand 339 at the Royal Smithfield Show

BRITISH SUGAR CORPORATION LTD

Handling and Winter Feeding of Cattle

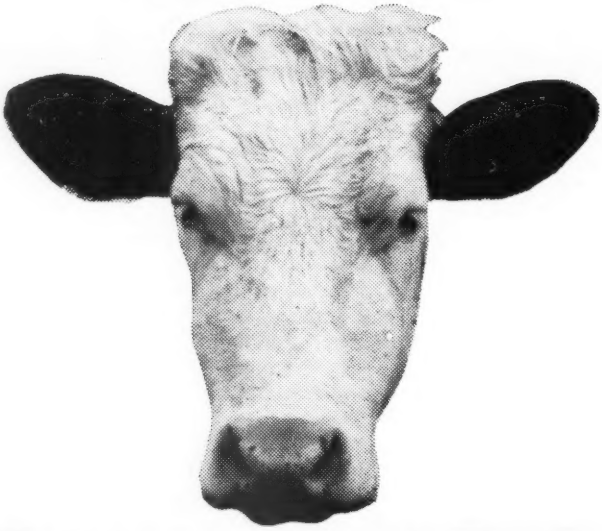
This feature, on the subjects of equipment for handling and treatment of cattle and the winter feeding of dairy cows, contains articles by:

★ **J. F. Cottam, A.R.I.C.S.,** who joined the Agricultural Land Service in 1946 and is now Land Commissioner at the Ministry's Carlisle Divisional Office.

★ **A. H. Adamson, B.Sc.(Hons.),** who is a Nutrition Chemist in the National Agricultural Advisory Service in the Yorks and Lancs Region

'Cattle really like Beet Pulp'

-reliable source



Sugar Beet Pulp mixed with barley is a better feed than barley alone

See us on stand 339 at the Royal Smithfield Show

BRITISH SUGAR CORPORATION LTD

Handling and Winter Feeding of Cattle

This feature, on the subjects of equipment for handling and treatment of cattle and the winter feeding of dairy cows, contains articles by:

★ **J. F. Cottam, A.R.I.C.S.,** who joined the Agricultural Land Service in 1946 and is now Land Commissioner at the Ministry's Carlisle Divisional Office.

★ **A. H. Adamson, B.Sc.(Hons.),** who is a Nutrition Chemist in the National Agricultural Advisory Service in the Yorks and Lancs Region.

The author, **J. F. Cottam,** a Land Commissioner in the A.L.S., discusses the merits of various types of equipment used for handling and treatment of cattle

Equipment for Cattle handling and Treatment

MANY years ago a stout Yorkshire farmer of my acquaintance, and a Vicar's Warden to boot, told me that the only thing that made him blaspheme was loading pigs. Pigs are, I suppose, the ultimate problem in loose housing, but my friend's cattle were always kept tied up when indoors. I have no doubt that if his beasts had been loose housed he would have added the cattle to the list of things that made him short-tempered. The fact is that more and more cattle are being loose housed. There is an increase in beef cattle herds and more dairy herds are kept on loose housing systems. This adds to the problem of giving the beasts veterinary attention of all kinds, dressing against warble fly, and weighing and sorting, all of which require properly designed equipment. On all too many farms there is either no equipment at all, or what there is available is badly designed and often badly maintained. One wonders how many farmers, workers and members of the veterinary profession may have been lamed each year because good equipment was lacking or there was dangerous improvization.

Steel versus timber

The first requirement for handling cattle is a properly designed crush. There is no doubt that there is only one good material for making this equipment and that is tubular steel. This almost compels the purchase of a factory made job as few farm workshops will be able to bend and weld steel tubing. I have seen a number of crushes welded up on the farm out of angle section steel, some of the sharp edges being dangerous to the point of being lethal to man and beast. Timber crushes can be made safe with rounded edges but have the disadvantage of limiting access to the beast. If the timbers are to be made strong enough to contain a fractious animal they must be much larger than the steel tube of equivalent strength. Advocates of timber crushes are right in saying they are quiet in operation, and this is an advantage. I have yet to encounter a factory made steel crush which did not accompany every operation with a resounding clang. It is

surely not beyond the wit of the manufacturers to equip these crushes with nylon or rubber bushes to make them relatively silent in operation. Of course this silence would add to the cost, but it would remove one source of criticism of the proprietary steel product.

What to look for

The ideal cattle crush must provide for all parts of the animal to be made accessible while holding the beast securely. It should be of the correct dimensions for the class of stock that will use it and, ideally, it should be adjustable and quiet in operation. The gates and latches should be very robust but capable of being operated easily. Many farmers will find it an advantage to have a portable crush with a built-in floor, the whole equipment being designed to be lifted and carried on the hydraulic linkage of a tractor. There are many proprietary crushes on the market which fulfil these requirements. It is equally true to say that there are many crushes on the market which fall far short of these ideal qualities, and the farmer who goes shopping for a crush should have these in mind before he decides to buy. He should see as many as he can of the crushes that are on the market, if possible seeing them in action. A crush that looks fine on a stand at an agricultural show may reveal all sorts of short-comings when actually in use on the farm. Most of the proprietary crushes can be supplied with weighing facilities.

The best crushes have quick release yokes and removable sections or doors in the sides to permit access to all parts of the animal. The tail bar should have a wide range of adjustment. The crush should be from about 6 ft 6 in. to 7 ft long and have a maximum clear width of 2 ft 6 in. with provision to reduce the width to about 1 ft 6 in. This size should accommodate everything from a seven or eight months old steer to the largest Friesian bull. Most crushes have fixed horizontal bars fitted to the top and this bar should be about 6 ft above floor level.

Controlling the cattle

When designing a cattle handling layout one should not forget the race, a simple device to get the cattle into single file before they enter the crush, made from strong parallel fences about 2 ft 6 in. apart with the rails on the inside and the posts on the outside to give a smooth passage to the cattle. A race can be as long as the site permits, but it should have room for at least four beasts at any one time. A 'funnel' should be made at the entrance to the race to get the beasts to form a single file and it is best done by one of the fences widening out at an angle of about 45 degrees. Some people advocate a double splay of the fence at about 30 degrees, but others say that this can cause two beasts to become jammed at the entrance of the race. The matter is one for individual choice and the site available. If timber sides are used for the race they should be in the form of boards about 6 in. by $1\frac{1}{2}$ in. thick, with spaces of about 3 in. between, carried up to a height of at least 5 ft from the ground. The boards should be nailed or bolted to stout oak posts at least 4 in. square. Steel fencing can be made up of 3-in. tubing set in concrete with two horizontals of 2-in. steel tubing, the space below the bottom tubing being filled in with a flat metal sheet

about $\frac{1}{8}$ in. thick welded on to the tube. The metal sheet should come to about 3 ft 6 in. above ground level. A foot-bath can be formed in the concrete floor of a race if it is required. There is a lot to be said for a solid sided race as the temptation to use it for treating the cattle is reduced and, therefore, the risk of injury to man and beast is minimized.

Of course the best crush and race is useless unless the cattle can be brought to it and dispersed from it in an orderly fashion, and to get this job done easily, properly laid out pens are needed. Collecting, holding and dispersal yards are required if the herd is a large one. There can be no hard and fast rule about the size and shape of these yards, the design will often be dictated by the siting of existing buildings and roads. Sufficient to say that beef cows and calves require about 25 sq. ft per cow and calf, dairy cows require 12–15 sq. ft and beef stores 10–12 sq. ft. For beef cattle the yards can often be arranged between or alongside existing farm buildings, or within fattening and wintering yards. Beef cattle crushes and races are often sited between two pens, the cattle being assembled passing through the treatment area of race and crush and then held in the other pen. Dairy cattle need handling arrangements within the circulation of a yard and parlour system. In the latter case the race and crush can often be incorporated in the collecting yard, the circuit for treatment being arranged so that the parlour can be by-passed. The fences and gates used in the dairy cow set-up may well be made demountable if they get in the way of the milking routine. One side of the race can be an existing wall of a building, so long as it has a smooth surface and is substantial in construction. Only recently I saw a Hereford steer charge straight through the side of an existing building made of matchboarding which had unwisely been used as one side of a race. This resulted in 20 minutes of unproductive work by one veterinary surgeon and three farm men.

If the race is sited alongside an existing wall it should run up to an opening in the wall; a doorway is a suitable site. A gap of 10–12 in. between the end of the race and the crush enables an operator to have access to the rear of an animal secured in the crush. This gap should be able to be closed by a couple of small bars or a small detachable panel when it is not required. The crush can be in the open but it is much better to have it under cover. The light must be good and if electricity is not available a roof of translucent plastic sheets is helpful. It should not be forgotten that there should be a small area under cover near the crush where records and instruments can be kept on a bench or shelf.

It is always easier to make an animal go to where it can see another ahead and, if at all possible, the crush should be sited so that an animal waiting to enter it can see others that have been through the crush.

On hill farms pens are often required for handling both cattle and sheep. Of course the design of the gates and fences must be done with the cattle in mind. Adequate sheep pen fencing and equipment is not strong enough to hold cattle, particularly the beef cattle found in the hills, which are not used to being handled regularly. Half a ton or so of excitable beef on the hoof can do an impressive amount of damage to flimsy fencing. Races and crushes for cattle handling will rarely be adaptable to sheep handling and separate arrangements will have to be made for the sheep.

Winter Feeding of Dairy Cows

A. H. Adamson

THERE has always been a marked variation in the quality of hay and silage conserved for winter feeding and this year is no exception. Hay samples taken in Yorkshire and Lancashire and analysed by the N.A.A.S. at the beginning of this winter have shown a variation in starch equivalent (S.E.) from less than twenty-five to over fifty, i.e., from almost straw quality to a value approaching that of rolled oats. From previous experience it is known that a similar variation exists throughout the British Isles for both hay and silage. It is obvious that hay and silage should be well made and the importance of cutting grass early to achieve a product of high digestibility has been well publicised, but for a variety of reasons, there still exists an assortment of winter forages. Therefore, advice is required on the combination of various feeds needed to give the best results.

It is important to appreciate that any advice on feeding is only meaningful if the weight of food eaten is known. Every livestock farm should be equipped with a spring balance or some other means of check weighing feedingstuffs.

Hay

The adverse effects of weathering on digestibility are much less dramatic than is commonly believed and especially in relation to the effect of the stage of growth at which the original grass is cut. As an approximation, it is convenient to classify hay into three categories based on maturity, i.e., poor, average and good, although excessive weathering and/or sweating will reduce feeding value by one class.

Poor Hay. Hay with an S.E. of less than thirty and sometimes less than twenty-five (straw has an S.E. of twenty) usually consists of very mature hay cut during July without having previously been grazed and without very much leaf, either due to the type of grass or losses due to poor hay-making techniques. This type of hay should preferably be fed to dry stock but if it has to be fed to milking cows, the quantity should be restricted. If it is the only forage available, about 12–14 lb should be fed, together with 6–7 lb of a cereal mixture for maintenance; concentrates balanced for

milk production should be fed at the recommended rate according to milk yield, i.e., 3½–4 lb per gallon, depending on the quality of the concentrate. The cereal mixture can be made up from any combination of dried beet pulp, barley, oats and wheat but it is important to include a high phosphorus mineral, including trace elements, since poor hay usually has a low mineral status. The same principle applies to feeding good straw, except that the crude protein content of the cereal mixture should be increased to 13–14 per cent, by the addition of other sources of protein.

Average hay. This can be classified as hay which is still fairly mature but made at the end of June or even early July if it contains a fair proportion of leaf. An S.E. of thirty–forty covers this range and whilst forty is bordering on good hay, much of the hay analysed in N.A.A.S. laboratories has an S.E. of about thirty-five. Obviously there is less need to restrict the quantity of this type of hay but there should be restriction. It is common practice to feed hay to appetite and some Friesian cows will eat far in excess of the conventional 20 lb per day, but better results are likely to be achieved if no more than about 20 lb is eaten, as this will enable concentrates to be utilized rather more efficiently for milk production. In general, 20 lb of average hay is a good maintenance ration, but at the lower end of the classification an extra 2 lb of mineralized dried beet pulp or barley may be required for a satisfactory maintenance diet. The protein content of such hay is likely to be similar to that of poor hay requiring a balanced concentrate for all milk production.

Good hay. This is all too rare but at least more common now than in previous years. The installation of barn hay driers has influenced hay quality in some parts of the country by making it possible to conserve relatively young grass which cannot be adequately dried in the field. However, barn dried hay made from mature grass will fall into the average classification. If one is to obtain high-quality hay with an S.E. exceeding forty and sometimes up to fifty, it is almost essential that it is dried artificially. The same nutritional principles apply to feeding this material as to grazing good grass, i.e., the more the better. There seems to be no really satisfactory substitute for forage of high digestibility. N.A.A.S. Experimental Husbandry Farms have shown that if Ayrshire or Friesian cows are allowed this type of hay to appetite they will eat well in excess of 30 lb and some up to 40 lb and produce over three gallons of milk without supplementary concentrates. However, under farm conditions, the stocking density is usually such that the quantity of barn dried hay available allows only 16–20 lb to be fed per head per day. The best all-round results will be achieved by feeding the best hay to the highest yielders and having confidence in its quality. Twenty pounds of good hay will normally contain enough energy for maintenance and the first gallon. Bonuses are always attractive and early cut hay has its share. Not only does it have a high energy content but it usually contains a relatively high protein level. Mineralized cereals can therefore be used for the second and third gallon to give a complete ration for M + 3 of 20 lb of hay and 7–8 lb of mineralized barley costing about 3*s.* 6*d.* per day, compared to about 5*s.* 6*d.* for a mature hay diet, plus balanced concentrates. A further bonus which is not fully understood, is that this type of forage usually maintains solids-not-fat levels at the end of the winter when most autumn calving herds fed on mature hay experience a marked depression.

One word of warning against the dangers to both man and beast of feeding very dusty hay. The mould formed in damp hay or grain and the toxins they produce can endanger the health of animals, for example, by causing abortion and other disorders, or of man by causing farmer's lung. Expert advice should be sought as to the precautions which should be taken when handling such materials.

Silage

Apart from grossly overheated material it is not usual to have silage of such low quality as the poorest hay. It is convenient to classify silage into low, medium and high quality based on maturity or digestibility but, in addition, it is important to know of the effects of fermentation and dry matter content on dry matter intake.

Low quality. Late cut silage made at the end of June without being previously grazed has a feeding value similar to average hay, i.e., with a low S.E. and usually a low protein content. Feeding to appetite will provide no more than maintenance regardless of the dry matter level, and in some instances may even require an additional 2–3 lb of cereals. The composition of the mature grass from which this silage will have been made is likely to encourage a good acidic fermentation being relatively high in sugars, low in protein and not too wet. If, however, the silage has been made in wet conditions and the resulting fermentation is butyric the dry matter intake is likely to be reduced and cereal supplementation will certainly be necessary to make up the maintenance diet. Balanced concentrates will be required for each gallon of milk produced.

Medium quality. Grass cut at ear emergence or about the first week in June will have an S.E. of about forty to forty-five in the dry matter and a protein of about 12–14 per cent, although this can vary. There are generally more butyric or sour silages in this category than in the low-quality group and this can markedly reduce dry matter intake even though digestibility is little affected by this kind of fermentation. It is not advisable to expect more than maintenance from such material but the excess protein is usually sufficient to enable mineralized barley to be fed at 4 lb per gallon for 2–3 gallons. If the dry matter is relatively high, i.e., over 25 per cent as for wilted material, the fermentation is nearly sure to be good and dry matter intake could well be in excess of 20 lb per cow per day. This would provide for M + 1, with sufficient excess protein to enable supplementation with mineralized barley for the second and third gallons. Many farmers claim good results by using only cereals for all milk produced, even with medium quality silage.

High quality. Unfortunately, silage made before the end of May is a rare commodity and whilst a number of farmers claim M + 2 from silage alone and cereals for further production, this is more the exception than the rule. It is true that the protein content of some silages exceed 16 per cent and can be supplemented with cereals only, but the protein content is by no means an infallible guide to digestibility. In general, therefore, it is not advisable to exceed M + 1 from silage alone, and particularly in high yielding herds, unless the silage is made before the end of May, has a dry matter exceeding about 30 per cent and is fed to appetite for 24 hours.

It is often impracticable to feed two separate concentrates and in these cases, low-quality silage should be supplemented with concentrates con-

taining 16 per cent protein, medium-quality silage 12–13 per cent protein and high-quality silage cereals only.

The above comments can only be of a general nature but may be of some assistance in explaining any disappointing results or in helping to make better use of winter forage. More detailed information can be supplied by the local N.A.A.S. District Adviser or by obtaining the following leaflets (*free of charge*) from the Ministry of Agriculture, Fisheries and Food (Publications) Tolcarne Drive, Pinner, Middlesex.

Hay: Quality and Feeding—Advisory Leaflet 448

Feeding Value of Grass Silage—Advisory Leaflet 494

The following priced publications on this subject are also available from H.M.S.O., P.O. Box 569, London, S.E.1., Government Bookshops (addresses on page 608) or through any bookseller.

Barn Hay Drying—Mechanization Leaflet No. 23.
Price 1*s.* 6*d.* (by post 1*s.* 9*d.*)

Silage—Bulletin No. 37, Price 4*s.* (by post 4*s.* 4*d.*)

Sir Arthur Richmond, C.B.E.

(1879–1968)

Sir Arthur Richmond, C.B.E., former Controller of the Land Settlement Association, died on 6th November, 1968.

He will be remembered by all who knew him for the leading part he took in discussions with the Government on the formation of the Land Settlement Association, of which he was Controller from 1939 to 1948 and Chairman from 1948 to 1958.

For his services he was awarded the C.B.E. in 1946 and was knighted in 1955.

This article is a summary, written in the context of the research work from which it developed, of the stupefying bait operations against wood-pigeons which were carried out during the summer of 1968

Wood-pigeons

R. K. Murton **J. D. Norris** **R. J. P. Thearle**

UNDER the Protection of Birds Acts 1954 to 1967 authorized persons may be licensed, to use any poisoned, poisonous or stupefying substance to capture birds that are not legally protected. Experiments with baits coated with a stupefying drug, alpha-chloralose, led to defined techniques for controlling feral pigeons and house-sparrows but early attempts to catch wood-pigeons were not successful. In two previous articles (*Agriculture*, October, 1962, and October, 1963), however, a technique for catching wood-pigeons was described and results were given of trials carried out from 1959 to 1963 using alpha-chloralose on various grain and seed baits at a concentration of 1·5 per cent by weight. One of the advantages of using a stupefying substance and not a quick-acting poison is that any protected or game species caught can be allowed to recover and be released unharmed. Released birds suffer no ill-effects as alpha-chloralose breaks down in their tissues without leaving harmful residues. There is a difference in sensitivity among species—between 80 and 90 per cent of stupefied game birds recover, but only about 50 per cent of finches do so. These recovery factors apply only when birds are collected twice a day and cared for in baskets until they recover; if they are left exposed on the fields, mortality may be much higher. The risks to small protected species can be practically eliminated by using baits, such as peas or beans, which are too large for the birds to eat.

The 1959–63 trials showed that successful baiting required a fairly widespread (e.g., 100 × 100 yard square) application of bait at the correct density—about one seed per square foot was found to be satisfactory. There remained the problem of finding a reasonably selective bait that would attract wood-pigeons but not pheasants and partridges. Tic beans appeared promising as wood-pigeons would accept them quite readily (although cereals were preferred), but game birds did not find them particularly attractive; maple peas, on the other hand, seemed equally attractive to both pigeons and game birds. Further trials were required to prove this point.

Since the publication of the earlier articles, field trials using alpha-chloralose have continued every year and a number of factors have been confirmed; for instance, the bait density of approximately one item per

square foot has proved more satisfactory than other densities and tic beans have definitely been shown to be the most selective natural bait. The wood-pigeon's preference for tic beans has also been shown by laboratory experiments. In some trials small seeds, such as millet and linseed, have been used in addition to peas and beans. These were necessary to establish whether by laying two baits—one treated and the other not—it would be possible to attract wood-pigeons to the treated bait and other species to the untreated. The results have not been encouraging and a bait of tic beans alone has been the most effective. From 1964 onwards, alpha-chloralose has been used at a concentration of 2 per cent instead of 1·5, to compensate to some extent for the effects of weathering on the bait. Heavy rain quickly reduces its effectiveness with the result that fewer birds are caught, some becoming only partially affected so that they elude capture. The increase in concentration has not increased the risks to protected or game species.

Results of trials 1964–67

These trials were again carried out in the Eastern, East Midland and South-eastern regions of the Ministry of Agriculture, Fisheries and Food, and the results are shown in Table 1 on page 589. Trials in which treated small seeds were used have not been included as they exaggerate the dangers to small species and give a false picture of the actual risks involved. Small seeds would not normally be used in operations of this kind and the table gives the results obtained with large baits (beans, peas and maize). The main point of interest is the number of game and protected birds that died as a result of the trials. Of the 5,855 birds caught, 88·3 per cent were wood-pigeons, and the percentage of pheasants, partridges and protected birds accidentally killed amounts to less than 0·5 for each. The results include some trials done with artificial baits simulating peas or large-sized wheat grains. These were not particularly successful; it was not possible to obtain sufficiently realistic models and the baits disintegrated rapidly under adverse weather conditions. Trials using maize tended to catch rather more protected species than those with peas or beans, probably because maize is inclined to fragment more easily.

By 1967, therefore, it was clear that by using tic beans treated with alpha-chloralose at 2 per cent by weight, wood-pigeons could be caught with some measure of success when the bait was laid at a particular density on fields where the birds were likely to feed; with this method the risks to game and protected species could be kept to a minimum. It was obvious, however, that it was impracticable to apply the technique on a sufficiently wide scale to have any significance as a means of population control. Considering the wood-pigeon on a national level, the expense involved in such wide-scale operations would not be warranted. On the other hand, individual farmers suffer great losses from wood-pigeon depredations, and stupefying baits can possibly be of help to them. By laying baits on fields of vulnerable crops it is possible to attract wood-pigeons to the bait and so remove birds that would otherwise be causing damage; in this way the crop would not be attacked for a few weeks until pigeons refilled the vacant gap and protection could be given, over a period when the crop is particularly susceptible. The method could thus be used as a form of crop protection and as an alternative to shooting and not as a means of population control.

Table 1 **Birds caught during 1964–67 trials (large-sized baits)**

Number of Trials	Wood-pigeon	Stock Dove	Pheasant (released)	Pheasant (died)	Partridge (released)	Partridge (died)	Corvids*	Protected birds (released)	Protected birds (died)	Other non-protected birds	Total
70	5,167	61	99	16	74	26	318	37	25	32	5,855

*rooks, carrion crows, jackdaws and magpies

The Bedfordshire trials

All the trials from 1959 to 1967 had been carried out by Ministry staff and landowners or occupiers co-operated by providing sites and, in some of the later trials, actively assisting in searching for stupefied birds. These trials had produced few casualties among game and protected species, but it was often argued that in the hands of non-Ministry operators the technique would involve greater risks. It became necessary, if a wider issue of licences were to be contemplated, to carry out trials in which occupiers only were involved and were allowed, after instruction, to lay ready-made-up bait and carry out all searching and picking up on their own. This stage was reached in April, 1968.

The intention was to carry out the trials in Lincolnshire but the foot-and-mouth disease epidemic prevented this and the site was changed to the Maulden area of Bedfordshire. This consists mainly of holdings of small acreage where market garden crops are grown. The local practice is to hire out land for the growing of brassicas, and there are sometimes four or five occupiers to a field.

Twenty-seven occupiers volunteered to take part in the trials and were issued with licences; of these, twenty actually laid bait and forty-one separate trials were undertaken on thirty-six different sites. Most of the fields used were planted with young brassicas, but a few contained seedling peas. Each licensee was issued, initially, with 80 lb of tic beans treated with alpha-chloralose at 2 per cent by weight. Instructions were issued that this quantity of bait should be laid on an area of approximately 10,000 square yards which would give a bait density close to one bean per square foot, and it was explained that the area laid should be not less than 50 yards wide. This was to ensure that a reasonably large, thinly scattered baiting area would result, as it was considered important that the bait should not be laid in narrow strips which would reduce the chance of the birds finding it. In spite of these instructions, eighteen licensees did not follow this procedure on at least one occasion, usually by reason of laying only a proportion of the bait supplied. In many cases this did not interfere seriously with the trials and in some instances it was sensible to deviate from the recommendations,

as when the field was very small. On no occasion did the wrong laying of bait produce an increased take of protected or game birds. Some of the licence holders were later issued with further quantities of bait, so that a few used considerably more than 80 lb.

The results of the trials are shown in Table 2 on this page. In this table one series of three repeated trials is shown as one. A total of 1,393 woodpigeons was taken and the only reported accidental casualties were one dead pheasant and one partridge killed by a fox. Eight other pheasants and one partridge were taken, but recovered and were released. Of protected

Table 2 **Results of the Bedfordshire trials**

Trial No.	Wood-pigeons caught	Protected and game species:			Corvids caught	Man-hours	Quantity of bait laid (lb)
		caught	died	released			
1	36	1 pheasant	—	1	23	11¼	80
2	12	—	—	—	5	2	80
3	0	—	—	—	—	—	80
4a	47	—	—	—	—	2	80
4b	57	1 turtle dove	—	1	1	3¼	80
5	61	3 pheasants	—	3	2	14	60
6	8	—	—	—	—	9	80
7	1	—	—	—	—	1¾	80
8	8	2 partridges	1	1	—	6½	140
9	81	—	—	—	2	4¾	80
10	11	—	—	—	—	4	80
11	15	—	—	—	1	3¾	80
12	29	—	—	—	—	4¼	80
13a	31	—	—	—	1	8	80
13b	23	—	—	—	—	3	60
14	28	—	—	—	3	6	80
15	0	—	—	—	—	2½	80
16	130	1 skylark	—	1	25	13	240
17	15	—	—	—	—	3¾	20
18a	76	2 pheasants	—	2	—	5½	80
18b	18	—	—	—	—	2	35
19	4	—	—	—	—	2½	40
20	6	—	—	—	—	2½	40
21	80	—	—	—	42	3	80
22	55	—	—	—	—	14	80
23a	47	—	—	—	3	not known	80
23b	12	—	—	—	—	not known	40
24	0	—	—	—	—	1½	20
25	27	—	—	—	—	2	80
26	21	—	—	—	—	27	80
27	42	—	—	—	—	3¼	40
28	27	—	—	—	20	10½	80
29a	78	—	—	—	3	2½	320
29b	56	—	—	—	4	1¾	
29c	64	—	—	—	—	1¾	
29d	79	2 pheasants	—	2	—	5¼	
29e	50	1 pheasant	1	—	—	2¼	
29f	58	—	—	—	2	3¼	
Total	1,393	13	2	11	137	193¼	2,735

species, only one skylark and one turtle dove were picked up and both recovered. Corvids were the only non-protected birds affected and of these 137 were taken—they were usually recorded by the occupiers as 'crows', but most were probably rooks, although at least seven jackdaws and two carrion crows were caught; one magpie was captured but was allowed to recover and was released. In all, 2,735 lb of bait was used and the labour involved in searching and picking up was recorded as just over 193 man hours.

In these trials the purpose was to protect crops, using the method as outlined above, with the baits laid on vulnerable crops—young brassicas or peas. The criterion is not the number of wood-pigeons caught, but whether damage was prevented on the crops involved. In this case, however, the trials were not designed to test efficiency (about which sufficient information has already been obtained) but to test the safety of the method in the hands of occupiers. Nevertheless, it can be said that about half the trials were 'successful' in that most of the pigeons which were on the crops were caught with the baits. At the end of the trials the occupiers were asked whether they thought the method was practical and reasonably economical in relation to labour and all replied in the affirmative. This applied even to those occupiers who caught very few birds, and they admitted that their assessment was based on the success of other licence holders who had made their results known. The cost of the bait was not considered and occupiers were not requested to pay for it but 80 lb of treated tic beans cost about £5 at current retail prices.

Table 3 **Birds caught with tic-bean baits: 1963–67**

Number of Trials	Wood-pigeon	Stock Dove	Pheasant (released)	Pheasant (died)	Partridge (released)	Partridge (died)	Corvids	Protected birds (released)	Protected birds (died)	Other non-protected birds	Total
28	1,914	18	54	7	12	3	133	7	6	6	2,160
%	88·6	0·8	2·5	0·3	0·6	0·1	6·2	0·3	0·3	0·3	

Risk to protected species

The number of protected birds reported as being affected during the trials was very small, as was also the number of game birds. Not many game birds are to be found in the area, although one occupier maintains a shoot of 700–800 pheasants. From inspections by Ministry officers who visited the occupiers during the course of the trials, it seems that considerable care was taken with protected birds and licensees were very sensitive to their responsibilities in this respect.

A more realistic assessment of the risks involved can be obtained from the figures for the 1963–67 trials using tic beans, which covered a wider range of conditions and were more strictly controlled. These are shown in Table 3 on page 591. From this it is seen that the number of wood-pigeons taken forms 88·6 per cent of the total catch, and non-protected birds (including corvids) amount to a further 7·3 per cent. The total percentage of protected species and game birds that were accidently killed was only 0·7, and these trials were carried out mainly in areas of high game density.

It would seem, therefore, that the use of tic beans treated with alpha-chloralose offers a reasonable method of protecting crops such as brassicas or peas at certain times of the year, and can provide an alternative to shooting which is probably less time consuming and could be less expensive. Risks are small, provided that operations are carried out carefully, and the Bedfordshire trials show that the method can be used responsibly and competently by occupiers.

R. K. Murton, B.Sc., Ph.D., is a Principal Scientific Officer and **R. J. P. Thearle, B.Sc.**, a Senior Experimental Officer of the Ministry of Agriculture, Fisheries and Food Field Research Station, Tangley Place, Worplesdon, Surrey. **J. D. Norris, B.Sc.**, is the Regional Pest Officer for the Cambridge Region.

NATIONAL AGRICULTURAL ADVISORY SERVICE

South Coast Glasshouse and Mushroom Advisory Unit

A new unit of the National Agricultural Advisory Service to help the highly specialized and expanding glasshouse and mushroom industries in West Sussex and Hampshire will commence operations on 2nd December, 1968. Its function will be to provide a comprehensive advisory service through a co-ordinated specialist team operating over the whole area, in place of the separate county services operating at present.

The unit will take over full responsibility in West Sussex and Hampshire for advice to producers with 1,000 square feet or more of glasshouse area and to mushroom growers, including work in connection with the Horticulture Improvement Scheme and other related statutory duties.

The present N.A.A.S. advisers in West Sussex and Hampshire will continue to provide advice and deal with grant schemes in respect of all other horticultural crops and holdings.

Rothamsted Experimental Station

Report for 1967

Sylvia Laverton

THIS year, as usual, the greater part of Rothamsted's 434-page annual report[1] is devoted to recent research results. In addition, there are 59 pages of abstracts of scientific papers published by the staff in 1967/68, a report of the latest work of the Soil Survey of England and Wales, and two long review articles. One discusses the findings of the ley/arable experiments, the other reports on the massive effort going into the search for substitutes for organo-chlorine insecticides used to protect cereals against soil insects.

The value of leys in arable farming systems has been debated with considerable vigour over the years. The fact that integrating two essentially different types of farming poses problems of economics and management, not readily soluble by experimental methods, has left room for controversial argument. But there is one important aspects of ley farming—the extent to which leys can increase the yield of subsequent arable crops—that can be evaluated only by means of field experiments. The results obtained from Rothamsted's investigations have done much to clarify the issue.

Ley/arable experiments

The first long-term ley/arable experiment began at Woburn in 1937. A second started at Rothamsted in 1949. In addition to measuring the effects of leys on the yields of subsequent arable crops, these experiments are greatly aiding understanding of the value of organic and inorganic residues in the soil, and is throwing new light on soil fertility problems in general. In both experiments arable test crops were grown on plots that had previously carried three years of ley or three years of arable cropping, and their yields compared. At Woburn the test crops were sugar beet followed by barley. The ley systems there were a three-year grazed ley or three years of lucerne cut for hay, and the arable sequences were either potatoes/rye/seeds hay or potatoes/rye/carrots. At Rothamsted test crops of wheat/potatoes/barley followed three years of lucerne cut for hay, a three-year ley of grass/clover grown with ample PK but no fertilizer N, or a three-year ryegrass ley receiving moderate dressings of N.

[1]Rothamsted Experimental Station Report for 1967. 20*s*.

Comparison of results

The results both at Rothamsted and Woburn show that yields from arable crops in the rotation are usually no larger than in continuous arable cropping. Indeed, so much P and K is taken off cut leys that, unless the loss is made good by additional dressings, soil reserves are depleted and yields of succeeding arable crops are diminished.

Provided that the arable rotation is designed to avoid the build-up of soil-borne pests and diseases, and that adequate nutrients are applied to make good the amounts removed by cropping, the value of a ley to the subsequent arable crops can be assessed at little more than the cost of the extra fertilizer N required to achieve optimal yields without a ley. At Rothamsted this was about 0·5 cwt N/acre for the first crop (wheat) and about 0·2 cwt N/acre for the third crop (barley). At Woburn, first year effects—the only ones measured—were a little greater. How far these results apply to other soils and farms will be known in 1968 when detailed results are expected from six similar experiments on N.A.A.S. Experimental Husbandry Farms.

Meanwhile the Rothamsted conclusion is that, because leys have so little effect on the yield of following crops, their value must be judged on the amount and quality of fodder they produce compared with that of permanent grass, and on their value as alternative crops to control soil-borne pests and diseases.

The ley/arable experiment at Rothamsted has produced some notably good yields of winter wheat. Over the years some plots have consistently given more than 60 cwt/acre and in 1967 yields exceeding 70 cwt/acre were recorded. The observation that comparable manuring in other Rothamsted fields usually gives smaller yields is attributed to the good measure of control over soil-borne pathogens achieved with the crop rotations of the ley/arable experiment.

Control of soil-borne pests and diseases

Soil-borne fungi that depress yields are a serious problem where cereals are grown repeatedly on the same land. Field work at Rothamsted has demonstrated that take-all and other diseases can be controlled by treating the soil with formalin, but the beneficial effects last for one crop only and treatment is not an economic proposition. Also, three years' experience now indicates that with repeated applications of formalin, the beneficial effect lessens, and that treatment may interfere with the decline in take-all that occurs naturally when a succession of cereal crops is taken.

Chemical treatment has proved much more useful against nematodes. In several experiments on 'Docking disorder', which is caused by free-living nematodes, large increases in yield were obtained by using such well-known nematicides as 'D-D', applied not only as usually recommended to whole fields, but also in smaller amounts to rows where the beet was to be sown later. In addition to benefiting greatly from these nematicides, sugar yield was increased from 29 to 62 cwt/acre in one experiment at Thornton near York, and from 48 to 80 cwt/acre in another experiment at Hellesdon, Norwich, by drilling a few ounces per acre of a granular systemic nematicide called 'Temik' with the seed in the furrow. Trials with several materials of this type suggest that they offer a practical method of increasing sugar-beet yields in light sandy soils where free-living nematodes are prevalent. Larger than usual dressings of fertilizer N seem essential to obtain the greatest yield where 'Docking disorder' is liable to occur.

Damage by weeds and slugs

Attempts to grow winter wheat by direct seeding in unploughed land sprayed with herbicide again failed in 1967 on Rothamsted's heavy soil because too many grassy weeds survived. At Woburn, where the method has previously been satisfactory, slugs were troublesome. Much debris remained on the surface of the plots after treatment with paraquat and the slugs infesting this material severely damaged the young wheat. Grain yields were 28 per cent less than on the ploughed plots where there were few slugs. Potato varieties differ in their susceptibility to slug attack. A preliminary experiment with King Edward, which is often damaged, and Pentland Falcon, which is not, suggests that the slugs may be attracted to susceptible varieties by a water-soluble substance that diffuses from the growing tuber into the soil. Tests with some amino acids and sugars found in potatoes indicates that the palatability of different varieties to slugs may be related to the concentration of sucrose in the mature tubers. This possibility is receiving further attention.

Aphid warning systems

Early warning systems that tell farmers when an invasion of insect pests is imminent enable counter measures to be taken in good time, thus minimizing crop damage. Already there are many local aphid warning systems—10 in England, including the Sugar Beet Corporation's extensive scheme, and at least 12 major schemes in western Europe. The relative efficiency of four methods of assessing aphid infestation—the 40-foot suction trap, yellow sticky traps, yellow trays and crop inspection for aphids—is now under investigation at Rothamsted, with the SBC system as a model. In future it may be possible to evolve forecasting and warning systems for other insects. As a preliminary step, light traps and suction traps are being used in a national census of flying insects. The aim is to provide continuous information on abundance and distribution of pests and other insects in different regions throughout the year. Records of the arrival of migrant insects will be related to the large-scale meteorological situation.

The light trap network from Cornwall to the Shetland Isles was extended to 53 sites during 1967. At present there are seven suction traps, situated along the line of the East coast from Ashford in Kent to Dundee. The three most southerly, at Rothamsted, Broom's Barn (Suffolk) and Wye (Kent), will operate throughout the year to detect the earliest date at which different aphid species fly. Experiments with these traps has shown that only a few are needed to provide information applicable to a large area. Thus they can be used to form a nation-wide picture of aphid dispersion. A second line of traps at right angles to those already established is now coming into operation, and a reporting service, backed by data storage and retrieval in a computer, should be working within the next five years. Several European countries may ultimately co-operate. Meanwhile, by sorting and identifying the current aphid catch twice weekly, it is hoped to organize a tentative monitoring service for the N.A.A.S.

Sylvia Laverton, B.Sc. (Hons.), F.R.I.C., has been a regular contributor to *Agriculture* for many years. Primarily a science writer who specializes in agricultural and horticultural subjects, she has been agricultural correspondent to the *New Scientist* since 1958.

18. The South Cotswolds

W. D. Peck

AN area of great natural beauty is a hackneyed phrase, maybe, but a remarkably accurate description of the South Cotswolds. Falling from the thin, oolitic limestone soils at 700 ft to the Thames Valley gravels and difficult, puffy alluvial soils 500 ft below, with some heavy clays between, the district is a gentle contrast of soil type and scenery. Perhaps the best impression is gained by driving down to Cirencester along the Roman way. The pleasing, rolling hills of the Cotswolds drop away to the south and east and the district stretches out beyond Cirencester towards Cricklade, and to the Wiltshire Downs in the distance.

Bounded on the southern flank by the Thames which rises near Kemble, close to the now disused Sapperton Tunnel which carried the Thames and Severn canal beneath the Cotswolds, the district sweeps in a great curve from near Tetbury in the south, through Fairford, to Lechlade in the east. Then north along the Oxfordshire border to Eastleach, westwards in the valley of the Coln, a beautiful, meandering trout stream, and on to Fossebridge astride the Fosseway, back south before it cuts west again towards Tetbury.

The district is well served by roads, many of them Roman, like the Fosseway and Akeman Street, which brings tourists to the Cotswolds, some to

enjoy a landscape, though fashioned by man, that retains a quiet charm endowed by time and nature; others seeking relaxation in sailing, water-ski-ing and fishing make for the worked out gravel pits along the Thames Valley. Reinstatement is rarely satisfactory, and with a high-water table often impossible, and the development of an amenity for land locked residents to enjoy is an attractive alternative use. It is perhaps doubtful what amenity attaches to the adjoining farms, but the planner's concept of a Cotswold Water Park is surely better than the less agreeable use of gravel pits as tips for refuse and old cars which scar the countryside.

For those with a head for statistics, the district runs to 82,500 acres, with 270 holdings over 15 acres. It is an area of large farms—more than a half over 150 acres and a fifth exceeds 500. On all but the small and low lying valley holdings, the farm economy is based upon corn, much of it barley. Almost 60 per cent of the district is planted to corn—a 20 per cent increase in the past ten years, which has cut deeply into the grassland acreage and the least profitable beef and sheep enterprises have been culled from many farms. Break crops have enjoyed a mild vogue but none has provided a really profitable alternative to barley. There is a small acreage of herbage seeds and recently interest is being taken in a new crop to the Cotswolds, sugar beet for seed, but the potential acreage is negligible and most who need a change from barley must look elsewhere.

Although few have turned to continuous corn on a large acreage, there is a good deal of experience to confirm that with complete control of grass weeds and timely cultivations, the Cotswold brash is eminently suitable for long run corn. The soil may be shallow, but it has a remarkably high clay fraction—up to 30 per cent—for a free working soil; indeed, were it not for the stones that keep it apart and aid drainage, it would be a most difficult and intractable soil to manage. As it is, it holds the moisture in times of drought far better than other free working soils, and the clay weathers continually to release potash and maintain soil reserves. It also seems that cereal cyst eelworm is less troublesome than on many other soils.

Though admirable for barley, it is not a soil for potatoes, nor is the summer rainfall dependable, and a mere 450 acres are grown. A few years ago the acreage was much larger, and supported by the premium paid for Cotswold seed, which has a high reputation among Cornish and Pembroke growers, in particular, because they have found that it bulks earlier than Scotch and Irish seed. The wider interest in Cotswold seed was built-up, however, on an A Certificate, which is no longer available, and demand has now dwindled and with it the number of growers to the handful who remain to meet a local market and the special trade with Cornwall and Pembroke.

Historically, the wealth of the Cotswolds was based upon the folded flock, kept for their wool and to maintain the fertility of the land for barley; sheep also made good use of the steep, unploughable banks that are a feature of many of our Cotswold farms. Today, sheep are no longer needed to restore fertility to the thin brashy soils and wool no longer pays the rent. Nor have we solved the riddle of intensive fat lamb production which is necessary if sheep are to meet rising costs and, consequently, they are making way for other, more productive enterprises. Numbers have been dwindling steadily—a few thousand each year and in many parishes all that remains as a reminder of the past importance of the golden hoof, are the fine churches, tithe barns and manor houses.

When a simple extension in the barley break is insufficient to meet the economic pressures that are responsible for the demise of the ewe flock, a choice is often made between pigs to convert the barley and take a second profit from corn, or milk. There has, of course, been a tradition of dairying on the wetter low lying land and smaller farms in the Thames Valley, and on a few larger, Cotswold farms as well, where the outdoor bail, pioneered by Frank Hosier, was a salvation in the 1930s. But the new interest in dairying is chiefly among those with high rents or interest charges to meet, whose imagination has been fired by the prospect of milking large herds through a one man herring-bone parlour, and the appeal of inexpensive cubicle or kennel housing and simple, self-feeding systems.

To allay the fears of those with fewer, if any, alternatives to milk, who may see these developments as a direct challenge to their future, it is perhaps relevant to note that there are today more than 1,000 fewer dairy cattle in the South Cotswolds than in 1958.

No account of the district would be complete without mention of the Royal Agricultural College at Cirencester. The oldest establishment of its kind—it celebrated its centenary in 1947—the College has played a major part in determining the patterns of farming in the Cotswold country by developing systems and techniques subjected to the acid test of published trading accounts.

This uniquely realistic approach to education which was pioneered by a former Principal—the late Professor Robert Boutflour—continues to play a part in shaping the agriculture not only of Gloucestershire and the South Cotswold district, but indeed throughout much of Britain.

The Ministry's Publications

Since the list published in the November, 1968, issue of *Agriculture* (p. 526) the following publications have been issued.

MECHANIZATION LEAFLETS

No. 22. Corn Drills (replacing F.M.L. 8) (New) 1*s.* (by post 1*s.* 3*d.*)
No. 24. Grain Driers: Continuous Flow and Batch Driers (New) 1*s.* 6*d.* (by post 1*s.* 10*d.*)

FREE ISSUES

ADVISORY LEAFLETS

No. 100. Didymella Stem and Fruit Rot of Tomato (New)
No. 525. Feeding Concentrates to Dairy Cows (Revised)
No. 533. The Warble Fly (Revised)

SHORT TERM LEAFLETS

No. 23. Chemical Weed Control in Strawberries (Revised)
No. 60. Field Beans (Revised)

The priced publications are obtainable from Government Bookshops (addresses on p. 608) or through any bookseller. Single copies of free items are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

Homestead Drainage

P. S. de Mattos, *Agricultural Land Service, Beverley*

In spite of the millions of pounds spent on new farm buildings since the last war the great majority of our homesteads were established during the last century. Although much has been done to improve old buildings and bring them up to date, drainage of the farmstead, for the most part, has been a haphazard business. Farmyard sewage was regarded as a necessary evil, its ultimate destination often being the most convenient ditch or duckpond. Although this article does not cover that subject, regard must be paid to the ultimate disposal system when planning the drainage of a homestead. Two separate systems of drainage are invariably necessary for the economic management of the homestead—one for roof and surface water and the other for sewage or liquid manure.

Surface water drains are necessary to carry away rainwater from roofs, paved areas and roads and they may discharge into the nearest field ditch or pond. All buildings should carry gutters to protect the fabric while down-pipes should lead into a drain.

To convey roof water to the ground, rainwater pipes should be of sufficient size to take the runoff from the area that they serve in the occasional heavy storm. One square inch of pipe area is usually allowed for 80 sq. ft of roof area. Seldom do we stop to think that even with a modest annual rainfall of 30 in. some 1,500 gallons fall per 100 square feet. Valley gutters should be designed to allow harmless overflow in the more freakish type of storm and should be capable of being easily cleaned out.

At ground level it is common practice to provide a shoe, discharging over a gulley, which is usually of glazed stoneware with a trap and a small grating. Under farm conditions, if this grating effectively keeps out solid material arriving at that point, it frequently becomes sealed and the water flows away over the surface or, what is worse, soaks into the ground beside the foundations of the building.

As an alternative, a rainwater pipe may discharge directly into a small catchpit with a solid cover. This facilitates rodding and inter-connection with other catchpits which may reduce the quantity of piping and junction chambers. Direct connection with a nearby manhole or catchpit is sometimes preferred. It must be possible to rod back; if not, a rodding eye should

be inserted. A small gulley may be satisfactory for receiving the runoff from small clean paved areas, but for larger areas or where straw, etc., may be blown about, a large road type or yard gulley would be better. These may have a bucket inside to make sludge removal easier. A catchpit will serve equally well for this purpose and can do double duty as a junction chamber.

Some use can be made of 'Y' junctions in a clean water system where two-way rodding facilities exist but, on the whole, they are best avoided. A junction chamber (manhole) should be built at every intersection, bend, change of gradient and in straight runs of more than 100 yards. Chambers are usually built of 9-in. brickwork on a 6-in. concrete base. The pipes are connected to glazed half-round channels set in the bottom of the chamber and benched up with fine concrete so that the smooth flow of water is disturbed as little as possible. Any blockage occurring at the junction or bend can be directly cleared and rodding can be carried out from the chamber. This type of chamber has a removable airtight cover, usually made of cast iron, which is quite satisfactory except when traffic is likely to pass over, when a steel or other heavy manhole cover is necessary. Some readers of this article may, at some time, have seen a vehicle firmly wedged in a manhole after going through an unsuitable cover. The cost of renewing the cover can be negligible compared with the damage that can be caused to the vehicle.

A catchpit should have a depth of about 2 ft 6 in. below the outlet to trap heavy solids entering directly from the surface or by a pipe. It is important to keep this cleaned out regularly. The pit may be about 2 ft 6 in. square for baling out or 2 × 3 ft if cleaning out is by shovel. For direct entry of storm water, the pit should be completely covered with a grating having round or oval bars. An angle steel frame with $1\frac{1}{2}$ in. diameter tubes set at $2\frac{1}{2}$ in. centres is recommended. Perforated plates, channel covers or flat bars are not satisfactory as they tend to become clogged.

According to the size of the homestead and fall of the land, drains may either all connect into one, leading to one outfall, or be connected in separate systems to two or more outfalls. With the consent of the River Authority, these may be into a pond, watercourse or ditch and should have a retaining wall to prevent collapse of the bank. The last section of the pipe should be of material not easily broken. On free-draining soils with a low water table, individual buildings or even individual rainwater pipes may be connected to soakaways. A soakaway must be deep enough to penetrate well into permeable soil and should have a minimum capacity of one cubic yard—more if a large roof area is involved. Several separate soakaways are better for big buildings. In stable soils, the soakaway may be a simple excavation filled with large, clean rubble or stone affording large interstices. Alternatively, a chamber may be built of bricks or blocks with the lower courses laid dry with weep holes.

Drains from single buildings to a nearby ditch or soakaway are sometimes laid with land drainage tiles as these are cheaper and require less skill to lay than glazed stoneware pipes. Unjointed piping should not be used under concrete; such drains are not easily rodded and are more susceptible to mechanical damage. Jointed pitch fibre piping will give very satisfactory service at a reasonable cost. Being light and in long lengths it is much easier and faster to lay than stoneware. Plastic and other forms of piping are also obtainable.

A similar but separate system should be laid for foul drainage. This should cover internal drainage from most buildings, including dairies, and any open areas which are soiled by livestock or other contaminating matter. This discharge is not acceptable to the River Authority without treatment so the system must lead to a treatment or disposal plant of which a large settling tank may be a major part. A soakaway will not normally be able to receive unsettled foul drainage for long before becoming clogged.

Silage effluent is so powerful that it should be kept out of the drainage system altogether. It is best led by an open channel (a pipe may be corroded or 'furred up') to a storage tank from which it can be taken away for dumping or spreading on the land where it will do no harm.

Many existing homesteads have single systems, the discharge from which will certainly be classed as effluent and will, therefore, be unacceptable to the River Authority. To establish separate systems, it is usually found easiest to use the existing system for clean water and construct a new foul drainage system. Occasionally, the reverse will apply and sometimes a new discharge can be made for the foul part of the existing system where this is reasonably separable.

Further information can be found in the Ministry's Fixed Equipment of the Farm Leaflet No. 21, *Drainage of the Farm Homestead*, price 2*s.* 6*d.* (by post 2*s.* 11*d.*) obtainable from Government Bookshops (addresses on p. 608) or through any bookseller. In addition, individual advice can be obtained through the Divisional Land Commissioner who is located at the local Divisional Office of the Ministry of Agriculture, Fisheries and Food.

Burning of Gorse

The burning of gorse is a regular and necessary practice on many farms. To minimize the risk to birds and other wild life, farmers who plan to burn gorse are urged to do so during the winter months and to complete it before the end of March, to avoid the nesting season.

Precautions should be taken. Sufficient people should be present throughout the entire operation, adequately equipped with 'beaters' such as wet sacks, shovels or spades, to control the burning and prevent damage to adjacent land, especially forestry plantations, other woodland areas or buildings.

Essential precautions are:

1. Burning should be undertaken only on a calm day.
2. Burning should always be carried out into (against) the wind; never burn down wind.
3. Burn early in the day whenever possible and do not burn after dusk.
4. Ensure that there is an adequate firebreak between the area to be burnt and adjacent property when this includes forestry plantations, other woodland areas or buildings.
5. Notify neighbours in advance when burning is to be undertaken (at least 48 hours notice is desirable). If there is any doubt about the adequacy of the precautions necessary to prevent the spread of fire, the Chief Fire Officer and, in the case of forestry plantations, the local Forestry Commission Officer should be consulted. Make certain also that adequate arrangements are made beforehand, to ensure the speedy calling of the fire brigade should the burning get out of control.
6. Make sure that all fires are out before leaving the area.

in brief

- Home-grown onions
- Housewives' choice
- Wakehurst Place

Home-grown onions

MR. J. D. WHITWELL, of Kirton Experimental Horticultural Station, Boston, Lincs, sees a good potential for home-grown onions if only growers would give more attention to their cultivation, harvesting and storage. 'Too many growers,' he said at a recent demonstration, 'treat the onion crop like beet, instead of paying attention to the detail which it needs. If farmers were prepared to do this we could get a big improvement even in one year and produce thousands of tons to compete with the imported product. As it is, we import approximately four times the tonnage we produce and the value of the imported crop is very nearly eight times that of the home-grown crop.'

A high proportion of inferior home-grown onions early in the season brings the whole crop into bad repute, he said. The result is that the big wholesale buyers look abroad—to France, Spain, Holland and Egypt—for the bulk of their supplies, some 221,000 tons a year.

Mr. Whitwell emphasized the importance first of harvesting as soon as 50–60 per cent of the tops have died down and then windrowing in the field for 7–10 days while weather conditions in September can still be expected to be reasonable. This must be followed by good, dry storage with free circulation of air. Diseased, damaged, thick-necked and small onions must be removed, and the tops left on to reduce the risk of neck rot. Drying temperatures of up to 80° F at a relative humidity of 65–75 per cent are recommended until the necks are completely dried out. After that, good coloration can be obtained by blowing ambient air through the onions on warm, dry days throughout the remainder of September and October. This will keep them dry and help to colour them.

After mid-October the temperature of the onion stack may gradually be brought down by blowing ambient air through the ducts when the temperature outside is approximately 5° F cooler than the stack temperature. By late November/early December the stack temperature should be in the low 40's and remain at or below this level until the onions are required for market. Just before marketing the onion skins may be crisped a little to make cleaning easier by blowing warm air through the stack. This must not be overdone, otherwise moisture will condense on the onions after they are in the market net.

The objective must be clean, dry, disease-free bulbs whose outer scales crackle to the hand. Given this kind of quality in increased quantity, home-grown onions could replace a considerable tonnage of the imported crop now costing the national exchequer £9 million a year.

Housewives' choice

IN an economically advanced society such as ours it is an indictment of the public conscience that the provision of food in all its variety is taken so much for granted. Supplies may have travelled half over the world or merely from a neighbouring area. A network of producers, manufacturers and the complex of the distributive trades place it at the housewives' choice in town supermarket and village shop alike. What is home produced and what is imported is seldom thought about by the majority of shoppers, unless there is a price differentiation in competitive products.

Put briefly and based on 1967 figures, the United Kingdom produces about one-half of our food requirements, or nearly three-quarters of all that can be

grown in temperate climates. Home production can claim more than two-thirds of our total supplies of carcass meat and offal, half for wheat and flour (but imports of wheat include varieties of hard wheat which cannot be grown in this country), just over one-third of the bacon and ham, 43 per cent of cheese and 8 per cent of butter. Almost all of the supplies of oats and barley, and of eggs, come from home agriculture. For maincrop potatoes, we are virtually self-sufficient; imports in normal years are restricted to new potatoes, of which the bulk comes in before the home crop becomes available.

Home supplies of beef and veal account for 77 per cent of our new supplies, mutton and lamb 43 per cent, pork 98 per cent and poultry meat (in a steadily expanding market) also 98 per cent. Most of our butter (92 per cent) is imported—from New Zealand (35%), Denmark (18%), Australia (12%) and other countries (27%). With cheese, similarly, 57 per cent is imported, nearly half of it from New Zealand. About two-thirds canned meat and nearly all our canned fish are imported, likewise the great majority of canned and bottled fruit, but most canned vegetables (81 per cent) are home produced.

Seasonality in foodstuffs was once the arbiter of their availability, but the choice, in and out of season, before the housewife today is wider than it has ever been. It reflects the continuing advances in food technology and transport facilities which have marked the second half of the twentieth century. A greater recognition of the problems being tackled by scientists, farmers and businessmen in meeting the full needs of an increasing population and the machinery of national and local government, which ensures the highest possible standards of hygiene in the end product, would add deeper meaning to the shopping list and translate our food statistics into something more than a column of figures.

Wakehurst Place

THE choice of the Thames riverside at Kew for the Royal Botanic Gardens is today accepted as not being the best that could have been made; the soil is poor, composed largely of gravel and therefore too free-draining, and the site is too exposed for many introductions from kindlier climates than ours. Indeed it is to the lasting credit of a long line of indefatigable directors, stretching back for nearly two hundred years to Sir Joseph Banks, and generations of scientific and professional staff that this in-built handicap has been overcome as successfully as it has and made the work of Kew world famous. Added to this the spread of London and the consequent air pollution have not made exactly the best environment for the healthy growth of a number of its shrubs and plants. Now, however, with the acquisition of the gardens of Wakehurst Place, Kew will literally have more breathing space.

Wakehurst Place, rich in history from the twelfth century, is close to Ardingly, deep in the countryside of East Sussex, an area of higher rainfall, a more water-retentive soil and cleaner air. The estate of 462 acres has been leased by the Ministry of Agriculture from the National Trust at a peppercorn rent for the use of Kew, thus enabling the cultivation of many plants which cannot be grown at Kew or do not grow well there. Sir Henry Price bequeathed Wakehurst Place to the National Trust when he died in December, 1963, and the estate already contains a superb collection of trees and shrubs, many from the southern hemisphere, which was established by his predecessor, Lord Wakehurst (Gerald Loder) one-time President of the Royal Horticultural Society, and added to by Sir Henry. Kew will now build upon this nucleus, its Sussex satellite, to make another botanical garden which we can confidently expect will not only enrich the countryside for the delight of the general public but become, as Kew has, another Mecca for botanists and students from every part of the world.

About half the estate was opened to visitors in October. Other parts will be made available as soon as they are ready.

Books

Profitable Farm Mechanization. C. CULPIN. Crosby Lockwood, 1968. 45*s*.

This authoritative publication brings up to date the information contained in the author's book, *Farm Mechanization Management*, while at the same time going much further into the economic aspects. It lives up to its title in providing the answers to those who are anxious to mechanize profitably, and that includes practically all those engaged in farming today. It appears at an opportune time when rapid changes are taking place in machine design to accommodate new management techniques and to offset the ever-shrinking manpower.

The author has combined his own experience with a wide range of published work and has presented the overall picture in a practical manner. The text provides facts and figures on up-to-date techniques, many of which are still controversial subjects. Typical examples include the economics of high-powered tractors; deep or normal ploughing; methods of slurry disposal; broadcasting or combine fertilizer sowing; liquid or solid fertilizers; spacing drills or mechanical thinning for sugar beet; flail or rotary mowers for cutting grass; tower silos or clamps for silage; grain drying or high moisture storage; single- or two-stage potato harvesting. The chapter on livestock engineering covers the latest systems for the mechanization of stock farming, including grinding and mixing, the automatic feeding of all classes of animal, building design and milking systems.

In any one class there is seldom a 'best' machine or technique, and choice must depend on circumstances. No two farms are identical but this book enables the farmer, or his consultant, to make the best choice for any set of circumstances. It also indicates whether it is necessary to resort to machinery syndicates or some other way to share little used equipment on the smaller farms.

The efficiency of any enterprise can be assessed by studying the information in the chapters on efficiency standards and work study, in conjunction with the data given in the appendices. These additional tables are based on the previous book, but they have been brought up to date and expanded. For instance, in the table on the effective capacities of field equipment, instead of having one figure for a tractor plough travelling at 2½ m.p.h., nine different ploughs are listed and the speed range is from 3 to 4 m.p.h.

This table has been expanded into sections covering soil working implements, distribution and drilling, corn hay and silage harvesting, specialist potato and sugar beet machinery and transplanters. A new set of data on labour requirements for various gang-work operations is used in conjunction with the effective capacity figures. These and the various other tables in the appendix are invaluable for reference purposes and are given in sufficient detail to enable adjustments to be made to cover any advances that may be made in the near future.

The book is illustrated with some ninety photographs and diagrams, which are well-chosen and of excellent quality. It should make a strong appeal to farmers, their advisers, students and those engaged in the production and sale of agricultural equipment.

W.H.C.

The Agricultural Revolution. ERIC KERRIDGE. Allen and Unwin, 1967. 84*s*.

There was no agricultural revolution in the late eighteenth and early nineteenth centuries, according to the author. Instead, he says, 'the agricultural revolution dominated the period between 1560 and 1767 . . . all its main achievements fell before 1720, most of them before 1673, and many of them much earlier still'. The 'conventional criteria' of the agricultural revolution are scattered like ninepins before Dr. Kerridge's attack. In his view 'the spread of the Norfolk four-course system belongs to the realms of mythology; the supersession of oxen by horses is hardly better; the enclosure of common fields by Act of Parliament, a broken yardstick; the improvement of implements, inconsiderable and inconclusive; the replacement of bare fallows, unrealistic; developments in stock-breeding, over-rated; . . . drainage alone seems a valid criterion'. No academic could write in such terms without considerable conviction and evidence.

Dr. Kerridge's book, in fact, is the result of many years' research. It has extensive references and many authoritative annexes, including no less than three separate indexes. Yet, despite its evident scholarship, this is an absorbing book, forthright and challenging.

The book is organized in three main sections. In the first, the author indicates in what respects previously held views on rotations, the introduction of new crops and improved breeds of livestock, farming innovators, etc., are inadequate. On parliamentary enclosure, for example, he suggests that by 1700 only 'one quarter of the enclosure of England and Wales remained to be undertaken'. Thus, he says, 'the hoary fable of the supreme importance of parliamentary enclosure should be relegated to limbo'. Secondly, there is an extensive survey of the 'farming countries' of England showing how the pace and form of improvement varied widely according to local circumstance. Finally, there are a series of chapters which seek to establish when and to what extent new practices were adopted. Often there are fascinating details —such as particulars of stocking and cropping of two or three centuries ago in parishes or on farms with which one is personally familiar.

In this most important study the author has shown that in many respects English farming was considerably more advanced in the seventeenth century than was formerly appreciated. Much accepted knowledge must now be superseded although many new questions require answers. In particular, it has become more than ever important to know how significant were the changes occurring after 1750.

J.D.S.

Grass and the Dairy Cow. PAUL WATKINS. Faber and Faber, 1968. 21*s.*

This book demonstrates that the problem of the 'small farm' is not so much one of acres but of attitudes. On his 63-acre farm in Suffolk Mr. Watkins has 93 milking Friesians, with a herd average of over 950 gallons; *Grass and the Dairy Cow* is the account of how he has achieved this in the ten years he has been farming.

This is not just another 'farming success' story, but a careful analysis of the main factors in profitable dairy farming, and how to put them into practice. The result is a most unusual digest of results from both research and practical farming (neither always quoted with approval!) in the evolution of a system whose key feature is a high gross margin per acre as a result of a high stocking rate, but without accepting a low yield per cow.

The real value of the book is that it considers how as well as why—with detailed descriptions of paddock layout, fencing design, cubicles, milking parlour, slurry pit, silage-making, etc., and discussions of aspects as diverse as herd replacement policy and labour management. Not every dairy farmer will agree with all the author's ideas—which one can summarize as veering towards Morrey rather than Holmes—but few will read his book without finding a profitable place for some of these ideas in their own enterprises.

W.F.R.

Chemical Fertilizers. Edited by GIACOMO FAUSER. Pergammon Press, 1968. 75*s.*

This book is about the proceedings of the XVII International Congress on chemical fertilizers, held in Milan during 1966. It begins with introductory papers by G. Fauser on 'Food and Fertilizer in developing Countries' and by Y. Coïc on Aspects chimiques, physiques et biologiques de la fertilisation. Then follows a series of technical and scientific papers on aspects of fertilizer production.

The first by K. S. Barsley contains studies of ammonium nitrate and conditions in solutions and in solids influencing its thermal decomposition. Included is an account of self-heating in compound fertilizers and a review of current views of fire hazards in the storage of compound fertilizers containing ammonium nitrate.

A paper by F. Bellia includes an examination of stages in the formation of urea from ammonia and carbon dioxide, illustrated by the FAUSER-MONTECATINI process. This is followed by a paper by L. Rosa on ammonia synthesis and one by F. Fraschetti on high-speed compressors used in ammonia synthesis.

A paper by K. A. Feldmann reviews world sources of phosphorus and estimates that known resources used at present rates will last for 3,000 years. It then briefly describes the extraction processes for obtaining phosphoric acid from raw phosphate, using hydrochloric, nitric, sulphuric and phosphoric acids, and methods of concentrating the crude acid; also thermal processes for making elemental phosphorus and phosphoric acid. There is a separate paper by

F. Bargocchini and R. Monaldi on ammonification of nitric acid—phosphate rock slurries which describes a procedure for lessening considerably the formation of insoluble ferric phosphates.

New methods of producing potassium sulphate from Epsom salt and K Cl, Gypsum and K Cl, Anhydrite and Kainite, are described by H. Hoppe. A key step is the salting-out of potassium sulphate brought about by adding Methanol to water solutions of the mixture of salts.

Another method of producing potassium sulphate from Kainite is described by L. Cavalli and M. Maggiore in which the double salt calcium potassium sulphate is first formed and potassium sulphate extracted from it by hot water. I. Mini examines processes of continuous leaching and crystallization used in the processing of potassium salts.

The longest paper (28 pages) deals with aspects of the technology of production of complex fertilizers and indicates some of the developments that may be expected.

No doubt much of the information in the book is well known to those in the fertilizer industry but it will be very useful to others wishing to know the nature of modern processes of fertilizer production and the properties of the more important products.

All the papers are well written.

N.H.P.

Game Conservation in the Changing Countryside. C. L. COLES. Sir Isaac Pitman, 1968. 27*s.* 6*d.*

This is an excellent and thoroughly practical book combining much wisdom and experience of early methods with modern thought and scientific discovery. Its author is the Director of the Eley Game Advisory Station at Fordingbridge and has a lifetime's experience of his subject. Not only that, he has the gift of writing simply and clearly. The book is well-illustrated and particularly easy to enjoy.

Older ways of farming encouraged game conservation providing food, ground cover and a measure of protection from danger. Now, covers and hedges are fewer so nesting sites are scarce. There is less waste ground and fewer weeds so foraging areas are reduced and chemical sprays keep down edible bugs. Efficient food production conflicts with a flourishing wild life.

The theme of the book is that only a little modification of farm planning is necessary to provide some measure of game conservation. That some concession is worth while is shown by the evident pleasure which many farmers get, not only out of game on their farm but from daily glimpses of a healthy stock of birds. To understand what is necessary to bring this about, we must know something of the requirements of the main game bird species, what their enemies are and how their life's hazards, risks and perils can be reduced. If man helps only a little, game survives and even flourishes.

Although the book is primarily concerned with game birds, I am sure the author would be sympathetic to a plea to farmers and landowners, that shelter, food and protection for game birds also benefits other wild birds. This is worth while in itself—a bonus in fact, in addition to a better stock of game.

R.G.A.L.

Economic Change and Agriculture. Edited by J. ASHTON and S. J. ROGERS. Oliver and Boyd, 1967. 42*s.*

In the 1870s Caird reviewed the state of British agriculture single-handed. Today, the task needs a committee of assorted specialists, partly, of course, because of the complexity of farming and its integration with the general economy, but also because of the sheer speed of contemporary change which only those closely concerned with particular types of problem can hope to follow effectively. It is, therefore, fortunate that the Agricultural Adjustment Unit, which was established at Newcastle upon Tyne University two years ago, could include as part of its function of 'collecting and disseminating information concerning the changing role of agriculture in the British and Irish economies' the organization of the conference reported in this timely book.

The eighteen papers it contains seek to provide information on agricultural problems, not answers to them. We are shown the main characteristics of the farming industry and the mass of disparate interests concerned with the land which makes the formation of public policies on its use so difficult; the relationship of the home farmer to the international trade in foodstuffs and to the allied trades on which he depends for so many goods and services; the varied and increasing demands on our limited land surface; and the social consequences of agricultural change. We are also given an account of overseas experience of similar problems and an assessment of the factors likely to influence future development. But we are not told what we ought to do. These economic surveyors have provided us with a map of the present and

as much guidance as they can on the terrain that lies ahead. The choice of routes and methods of transport is firmly left to us.

All this sounds a little dehydrated. Well, as a matter of fact, it *is* a little dehydrated. It is both a surprise and a relief to meet Mr. Beresford's brisk and astringent Farmer A after so many pages of painless generalized policy prose. It is, perhaps, significant that we are told little about the implications of the rise in the farmer's standard of education, or about the part-time holding which offers some small farmers a chance of rural survival. But this does not seriously affect the value and importance of a book which so lucidly and comprehensively presents the facts and figures, the trends and tendencies, the issues and possibilities of contemporary agricultural change. It should be read by all concerned with agricultural policies and planning.

N.H.

The Elements of Agricultural Adjustment. S. J. ROGERS. University of Newcastle upon Tyne, 1968. 5*s*. (by post 5*s*. 6*d*.).

This bulletin is an introductory one of a series to be published under the general heading 'Studies in Structural Change' by the Agricultural Adjustment Unit at Newcastle University.

As the preface says, the object is to provide a broad descriptive framework within which subsequent bulletins can be fitted. The result is a useful survey of the various effects of changes taking place in the agricultural industry today. It does, however, suffer from the fault of covering a number of controversial topics too briefly and, in particular, the section on farm incomes is far from adequate. It is, perhaps, unfortunate that this introduction is published before the main series because one can only judge the bulletin in isolation from what is to follow.

The shortcomings of the publication appear to become more obvious when topics are dealt with on a quantitative basis rather than a qualitative one. An example of this is the lack of consideration on how farming efficiency and type of farming affects levels of farm incomes. This has led to a comment on levels of incomes on farms of between 275 and 599 smds (i.e., 1—2 man farms) which is of a too general nature.

This bulletin introduces a series which should be of interest to anybody connected with agriculture whether he be farmer, student, or adviser. It is to be hoped the rest will be published soon to answer many points of interest which have been raised.

K.E.G.

books received

Meteorological Office Annual Report 1967. H.M.S.O. 11*s*.

Farm Management Accounting. F.R. No. 168. H. W. T. Kerr, Dept. of Agricultural Economics, University of Nottingham, 1968. 8*s*. 6*d*.

Long Ashton Agricultural and Horticultural Research Station Annual Report 1967. University of Bristol. 20*s*.

Forestry in the British Scene. Forestry Commission Booklet No. 24. H.M.S.O., 1968. 10*s*.

Farm Mechanisation. B.B.C. Publications, 1968. 6*s*.

Report and Guide to Experiments 1968. Liscombe Experimental Husbandry Farm. Ministry of Agriculture, Fisheries and Food.

Suckler Beef Production 1966 *to* 1968. Technical Report No. 10. The Beef Recording Association. Copies from Meat and Livestock Commission, P.O. Box 44, Queensway House, Bletchley, Bucks.

Experimental Husbandry Farms Farm Guides 1968

Rosemaund	*Drayton*
Boxworth	*Bridget's*
Great House	*High Mowthorpe*

Ministry of Agriculture, Fisheries and Food.

Change in the Structure of Yorkshire Farming. Farm Report No. 177. I. G. Simpson. Copies from the Agricultural Economics Dept., University of Leeds, 34 University Road, Leeds 2. 1968. 5*s*.

Aspects of Farmers' Business Behaviour I. International Journal of Agrarian Affairs. Vol. V, No. 4, July, 1968. Oxford University Press. 10*s*. 6*d*.

Gentlemen Peasants. A Gardener's A.B.C. Hugh Popham. André Deutsch. 21*s*.

Annual Report 1967. The Grassland Research Institute, 1968. 10*s*.

Sixtieth Annual Report 1967–68. Norfolk Agricultural Station.

Fairfield Experimental Horticulture Station Ninth Report 1967. Ministry of Agriculture, Fisheries and Food.

Changes in Milk Output 1963 *to* 1967. Milk Marketing Board. 10*s*. 6*d*.

Agricultural Chemicals Approval Scheme

Fifth list of additions to the 1968 List of Approved Products for Farmers and Growers and sixth list of additions to Chemicals for the Gardener.

CALOMEL
For control of moss and turf diseases.
Formulations for Spraying
Synchemicals M-C—Synchemicals

CHLORDANE
For control of earthworms in turf.
Liquid Formulations
Synchemicals Sydane 25—Synchemicals

CHLORMEQUAT
For the reduction in straw length and the strengthening of straw to prevent early lodging in wheat.
Liquid Formulations
Cycocel Plant Growth Regulator—Cyanamid

CHLORPROPHAM with LINURON
For control of many established and germinating weeds pre-emergence in daffodils, narcissi and tulips.
Liquid Formulations
Profalon—Hoechst

CUFRANEB
For control of hop downy mildew.
Wettable Powders
Embathane—May and Baker

MALEIC HYDRAZIDE
Liquid Formulations
Synchemicals Mazide—Synchemicals
Synchemicals Mazide 36—Synchemicals

MCPA
Potassium and Sodium
Salt Formulations
Chafer Soluble Powder MCPA—Chafer

MECOPROP with 2,4-D
Amine Salt Formulations
Methoxone 4X—Plant Protection

MERCURIC OXIDE
For control of apple canker.
Canker Paste
Santar—Sandoz

SODIUM CHLORATE
Formulations for Spraying
Synchemicals Syrate—Total Weedkiller
Synchemicals

Company Information

(i) The Craven Chemical Company has recently taken over the marketing of some of the products previously approved for W. J. Craven and Co. Ltd. This new company is operating from the same premises as the old company.
(ii) Ardleigh Spraying Co. Ltd., and Soil Fertility Ltd., have now ceased to market their approved products which have been withdrawn from the list.

Sixth List of Additions to Supplement No. 1 of 'Chemicals for the Gardener'

NANTCOL LIQUID WEEDKILLER—
Synchemicals
Based on sodium chlorate.

SYNCHEMICALS CHLORDANE 25—
Synchemicals
Based on chlordane for control of earthworms in lawns.

SYNCHEMICALS M-C—Synchemicals
Based on calomel for control of moss and certain diseases in lawns.

Company Information

The Craven Chemical Company has recently taken over the marketing of some of the products previously approved for W. J. Craven and Co. Ltd. This new company is operating from the same premises as the old company.

ACKNOWLEDGMENT OF PHOTOGRAPHS

Front cover John Topham Ltd. P. 557 M. B. Helps. P. 567 F. W. Keighley. P. 579 Imperial Chemical Industries Ltd. P. 596 Eagle Photos Ltd.

AGRICULTURE

Price 1s. 3d. net monthly (by post 1s. 9d.).

Subscription Rates, Home and Overseas: £1 1s. 0d. per annum (including postage).

Subscriptions may start with any issue and should be sent to:

HER MAJESTY'S STATIONERY OFFICE

49 High Holborn, London W.C.1
13a Castle Street, Edinburgh 2
Brazennose Street, Manchester 2
258-259 Broad Street, Birmingham 1
109 St. Mary Street, Cardiff CF1 1JW
50 Fairfax Street, Bristol BS1 3DE
7-11 Linenhall Street, Belfast BT2 8AY

Single copies can be purchased from any of the above-mentioned addresses or through a bookseller.

Printed in England for Her Majesty's Stationery Office
by Hull Printers Limited, Willerby, Hull, Yorks.
(K92) SBN 11 720757 8

The Problems of Birds as Pests

Institute of Biology Symposium No. 17

Edited by R. K. Murton and **E. N. Wright**

Infestation Control Laboratory, Field Research Station, Guildford, Surrey, England

November 1968, xiv+ 253 p.p., 70s.

This Symposium stressed the increasing conflict between man and wild bird life in such areas as aviation, public health and agriculture. Improved farm efficiency has focussed attention on the economic aspects of crop losses to birds, yet suggestions for a yearly cull of the most troublesome species meet with considerable protest from those interested in bird protection and conservation. The paradox between birds as pests and birds as pets is well illustrated by the familiar town pigeon; on one hand loved by the bird-feeding public, and on the other detested by Public Health authorities for its fouling of buildings and disease transmitting potential. Experience shows that these problems cannot be solved simply by killing harmful birds; scaring remains the most effective way to protect crops, using such techniques as recorded bird calls.

Contents
Birds and Aircraft—The Problems, Prospective Considerations Concerning Bio-Acoustics in relation to Bird-Scaring Techniques, Recent Developments in Bird Scaring on Airfields, Bird Recognition by Radar: A study in Quantitative Radar Ornithology, A Bird Warning System for Aircraft in Flight, Modification of the Habitat as a Means of Bird Control, The Rook Problem in N.E. Scotland, The Oyster-Catcher—A Pest of Shell Fisheries, Some Predator-prey Relationships in Bird Damage and Population Control, Urban Bird Problems, Bullfinches and Fruit Buds, The Quelea Problem in Africa.

Academic Press

London and New York
Berkeley Square House

111 Fifth Avenue

EVENSTORM IRRIGATION
★ Rotary sprinklers ★ Rain guns
★ Organic irrigation (effluent disposal)
★ Portable aluminium mains
★ Glasshouse and outdoor spray lines

EVENTHERM SPACE HEATERS—
Portable, oil-fired, up to 200,000 B.T.Us. Thermostatically controllable for frost protection in potato stores, etc.

Details from EVENPRODUCTS LTD., Evesham, Worcs. Tel. Evesham 6633/4.

STAFF VACANCIES
Agricultural colleges, Institutes and University departments
Commercial undertakings, etc.

Attention!
For the best results advertise your staff vacancies in the Journal of the Ministry of Agriculture

Agriculture
Full details from the Advertisement Representatives:
COWLISHAW & LAWRENCE (Advtg) LTD
2-4 Ludgate Circus Buildings, London E.C.4
(Smallest bookable space ¼th p.)

CERTROL
CERTROL
CERTROL
For Mayweed and other resistant weeds

WEEDAZOL
WEEDAZOL
WEEDAZOL
For Couchgrass, stubble and perennials in orchards

PRODUCTS OF RESEARCH
FORMULATIONS

Marks
A. H. MARKS & CO. LTD., WYKE, BRADFORD, YORKS
Telephone: Bradford 676372
Telegrams: Colour Bradford

TAS/MK84A

OFFICIAL APPOINTMENTS

General agriculturists and agricultural specialists of many kinds are frequently required in the effort to match the large demand from the developing countries. The vacancies advertised below are a selection from the many openings which exist now. While they are being filled, other vacancies are arising.

Salaries within the ranges quoted are assessed on qualifications and experience; and the terms of most appointments include free or subsidised accommodation, education grants, family passages, good leave on full pay, etc. A contributory pension scheme is available in certain circumstances.

Most appointments are limited to candidates who should be citizens of, and normally resident in, the United Kingdom.

BAHAMAS

Agricultural Officer

RC 213/14/01

Duties: To develop a market garden industry to supply the expanding hotel industry with fresh fruit and vegetables on New Providence and the Out Islands.

Qualifications: A degree in Horticulture or Agriculture, with post-graduate qualifications or experience in horticulture and a knowledge of irrigation and cultivation equipment.

Salary: £3,348—£3,960 p.a. Tax free gratuity 15%. Contract: 3 years.

FIJI

(1) Research Officer (Coconuts)

RC 213/62/011

Duties: To initiate and carry out a programme of research work on coconuts.

Qualifications: A degree in Agriculture with extensive experience in research work on tropical palms of economic importance.

(2) Soil Conservation Officer

RC 213/62/07

Duties: Supervision and maintenance of technical standards in soil conservation work, by liaison with District Agricultural Officers who administer all soil conservation extension, machinery and field staff. Arrange in-service training in soil conservation for field staff. Prepare lectures and examinations for the soil conservation course at the Fiji School of Agriculture. Assist in preparation of soil conservation publicity. Advise on soil conservation matters through the Director of Agriculture or through the Land Conservation Board.

Qualifications: A degree in Agriculture or Science with experience in practical soil conservation. Experience in tropical agriculture is desirable.

Salaries: £ Fijian 1,092—2,181 (£ Sterling 1,045—2,087) p.a. An inducement allowance normally tax free in the range of £ Sterling 508—829 p.a. is also payable direct to an officer's home bank account. Gratuity 25%. Contract 30–36 months.

OFFICIAL APPOINTMENTS

JORDAN

(1) Farm Settlement Adviser — *RC 213/94/01*

(2) Agricultural Engineer — *RC 213/94/02*

Duties: To be responsible for the layout of irrigated settlements in a Bedouin Settlement Scheme, and the general management of their crops.

The Engineer will be required to prepare and supervise cropping pattern, repair and maintenance of farm machinery.

Qualifications: (1) a degree in Agriculture with practical experience in irrigation and the use of machinery (2) a National Diploma in Agriculture or Agricultural Engineering or its equivalent with practical experience in farm machinery, irrigation and survey.

Salaries: (1) £2,500—£3,000 p.a. (2) £1,750—£2,750 p.a., according to experience and qualifications, subject to British Income Tax, plus a variable non-taxable overseas allowance ranging from £495—£1,125 p.a. depending on marital status. Single men preferred as mainly field work. Contracts —2 years.

MALAWI

Landscape Architect — *RC 319/134/06*

Duties: To design and supervise the construction of landscape schemes, including Government official residences, public buildings, parks and botanical gardens.

Qualifications: Candidates must be A.I.L.A. or have an equivalent qualification with experience in landscape architectural practice. Salary: £1,175—£2,600 p.a. In addition a supplement of £100 p.a. is payable direct to the officer's bank account outside Malawi and Rhodesia. Tax Free gratuity 15%—25%. Contract 2–3 years.

ZAMBIA

Planning Officers — *RC 213/132/05*

Duties: To take charge of field planning teams and to be responsible for regional conservation planning on a catchment and/or settlement plan basis.

Qualifications: a degree in Agriculture or Natural Science preferably with relevant post-graduate training and/or experience.

Salary Kwacha 1,944—4,464 (£ Sterling 1,134—2,604) p.a.

In addition an inducement allowance in the range of £ Sterling 243—429 p.a. is also payable plus a supplement ranging from £ Sterling 233—291 p.a. (payable direct to an officer's bank account outside Zambia). 25% gratuity. Supplement and gratuity are both free of local income tax. Contract 3 years.

If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:

Appointments Officer
MINISTRY OF OVERSEAS DEVELOPMENT
Room 324a, Eland House, Stag Place,
London, S.W.1.

MINISTRY OF OVERSEAS DEVELOPMENT

MINISTRY OF AGRICULTURE
FISHERIES AND FOOD

Plant Pathology

A quarterly publication presenting original contributions on plant diseases, plant pests, rodent and bird damage, nutritional and physiological disorders of interest to the mycologist, entomologist, helminthologist, soil or nutrition chemist, meteorologist and plant physiologist

Single copies 7*s.* 6*d.* (by post 7*s.* 10*d.*)

Yearly subscription 31*s.* 8*d.*
(including postage)

Published by
HER MAJESTY'S STATIONERY OFFICE

and obtainable from the Government Bookshops in London (post orders to P.O. Box 569), Edinburgh, Cardiff, Belfast, Manchester, Birmingham and Bristol, or through any bookseller